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76/A

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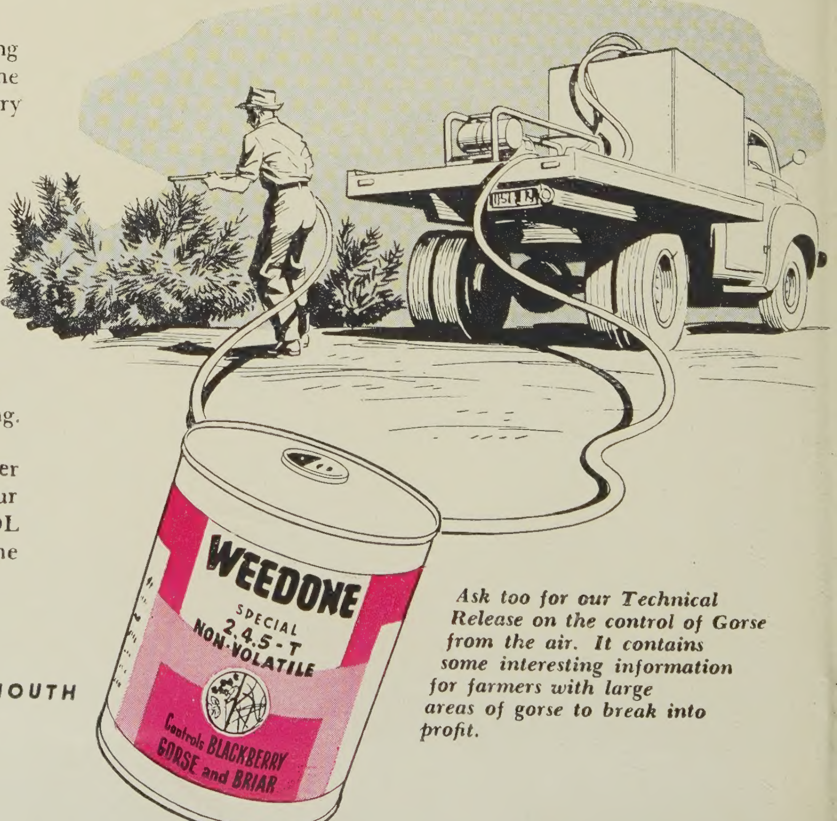

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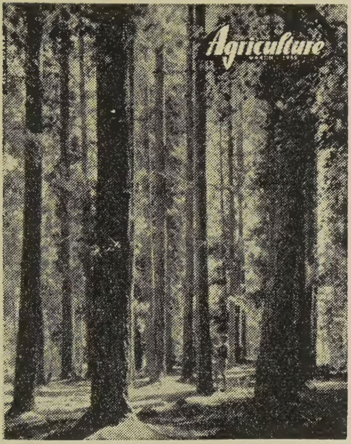
This Month's Cover



Many farmers have woodlots which provide much of the timber and fencing material constantly required on a farm. Such plantings are an excellent way of using small, hard-to-farm corners of a property. This month's cover, reproduced from a colour photograph by J. H. Johns, New Zealand Forest Service, shows a small but valuable 47-year-old stand of radiata pine in Hanmer State Forest, North Canterbury. Assessed in 1948, the stand had 161 stems per acre giving a volume to a 6in. top of 10,075 cub. ft. per acre. The mean annual increment was 246 cub. ft. per acre and the average height of the trees today is 120ft.

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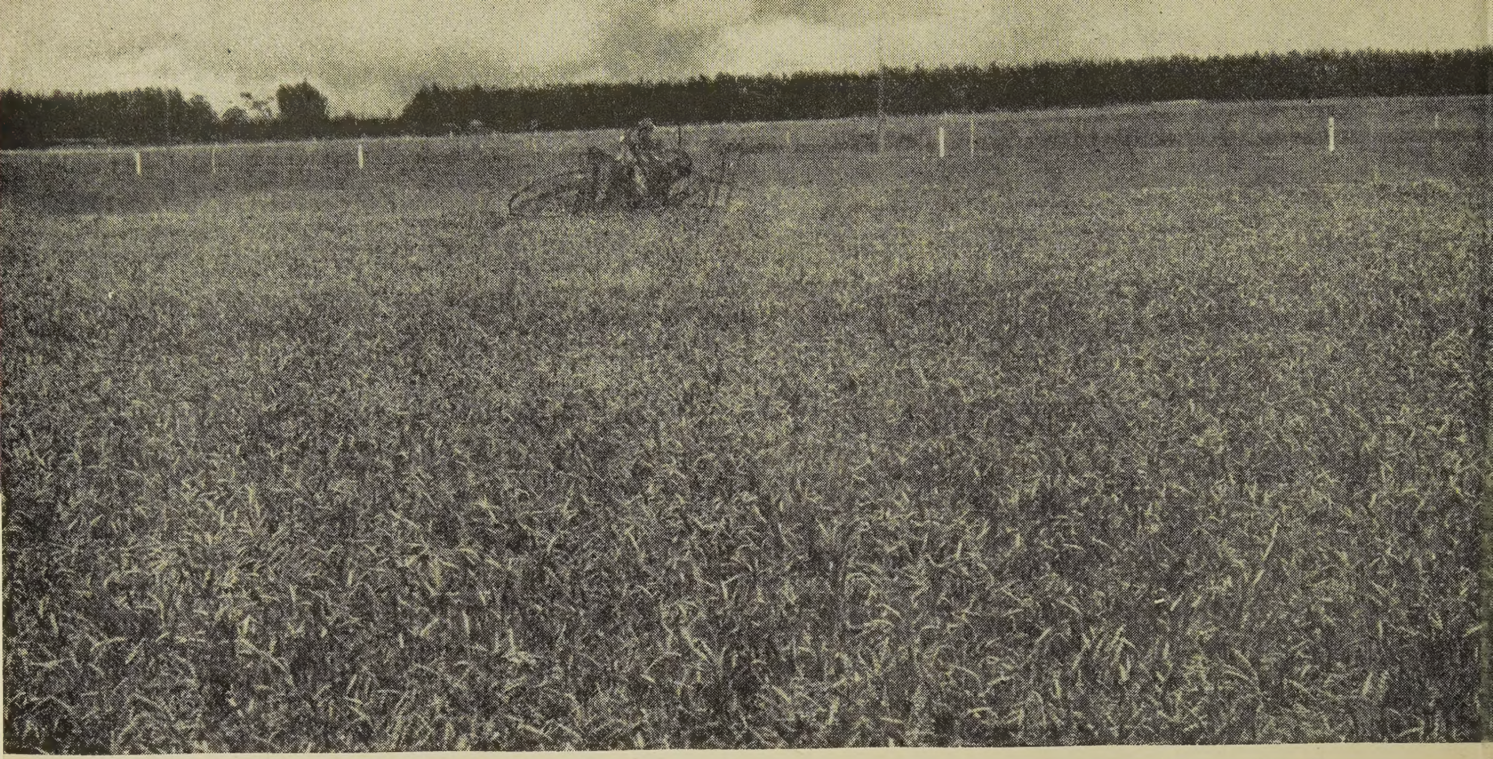


Harvesting nucleus seed of Aotea wheat.

Aotea Wheat—A Replacement for Cross 7

By L. G. L. COPP,
Principal Scientific Officer, Crop Research Division,
Department of Scientific and Industrial Research,
Christchurch

THE general objective of wheat breeding is the development of varieties with acceptable market quality. The variety Cross 7, released in 1934, was an immediate success, as it had the qualities needed by the wheat grower, the miller, and the baker, and by 1940 Cross 7 had become the most important wheat variety in New Zealand. In recent years, however, many farmers have found that Cross 7, when autumn sown, is not able to take full advantage of the increased fertility of the land built up under pastoral farming. There have been many reports of partial crop failures after severe attacks of root diseases. Farmers generally feel that there is need for a new general-purpose variety to replace Cross 7. Aotea, the new variety discussed in this article, has all of the agronomic features which made Cross 7 so popular, is more resistant to disease, is almost as good in baking quality, and yields about 23 per cent. more. This new variety has been produced at the Crop Research Division after many years of breeding and selection, and with the co-operation of the Wheat Research Institute, the Extension Division of the Department of Agriculture, and of the many farmers who over the past 9 years have made land available for trials.

▼ Ears of Aotea wheat.

THE release of this new variety may encourage farmers in New Zealand to grow a larger area of wheat and save some of the overseas funds now being spent on importations.

The bulk line 313,01 from which Aotea was selected has been tested in comparison with Cross 7 under a wide range of conditions of soil, climate, and management in many districts from Takapau in Hawke's Bay to Otautau in Southland over nine seasons.

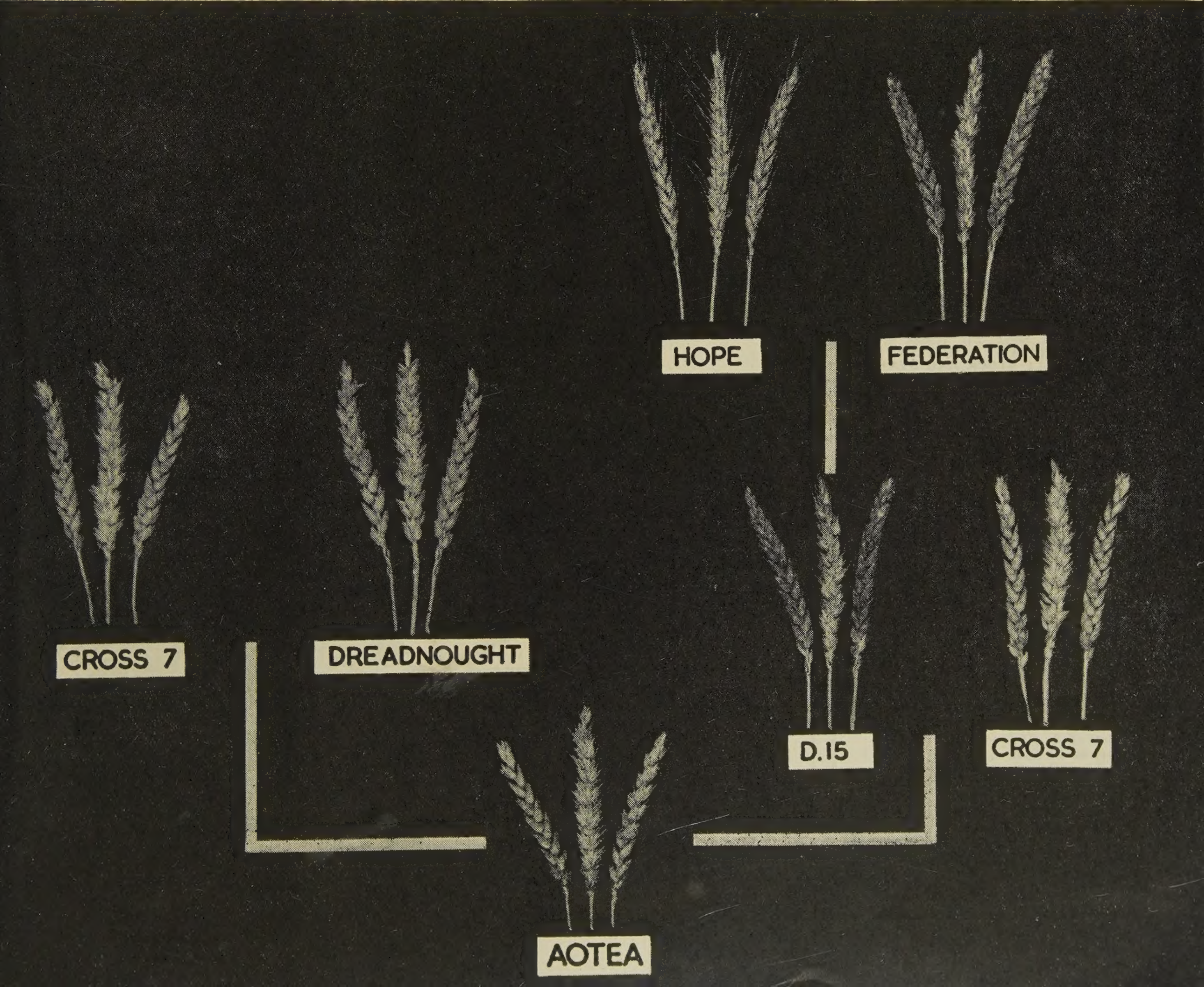
Aotea was derived from a series of crosses involving several parents, in contrast to wheats released before 1955, which were from direct crosses of only two parents. In 1936 Dr. W. L. Waterhouse, University of Sydney, sent to the Wheat Research Institute a collection of wheat hybrids to be used in the study of the New Zealand races of stem and leaf rust. One of these introductions, Hofed 1/24-2 (shown in the illustration as D.15), derived from the American variety Hope and the Australian variety Federation, was crossed in 1939 with Cross 7; and in the following year plants of the first generation were crossed with plants of the first generation of a combination of Dreadnought and Cross 7. The seed from the final cross was grown in 1941-42 and the grain harvested was held for sowing in 1943-44.

Individual plant selections were made in the second and third generations only, and the progenies of these single plants were grown, with Cross 7 plots for comparison, for the next 4 years. Lines considered to be inferior to Cross 7 in resistance to lodging or shattering, or in the size, shape, or number of ears, were rejected. Samples from progenies with higher yields than Cross 7 in small yield trials were milled and baked at the Wheat Research Institute, lines being rejected each year on both yield and quality, until only two lines remained for the first large field trial in 1948-49.

The grain harvested from this trial was sown in the following season in an extensive series of trials conducted by the Department of Agriculture in the districts where wheat was a major crop. One line was rejected after these trials, but the other, 313,01, was proved in trials over nine seasons to be very high yielding, and selections from within that line became the variety Aotea.

Yield Trials with 313,01

The majority of the trials comparing the bulk 313,01 with Cross 7 have been conducted by field officers of the Extension Division of the Department of Agriculture. These officers have carried out 98 such trials over eight seasons, and under conditions where


▼ Parents of Aotea wheat.

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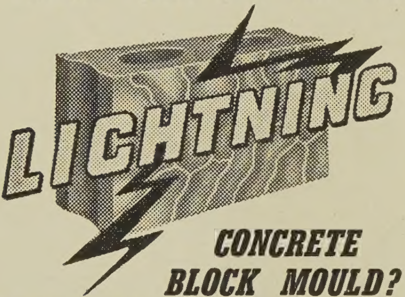

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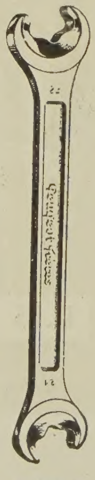

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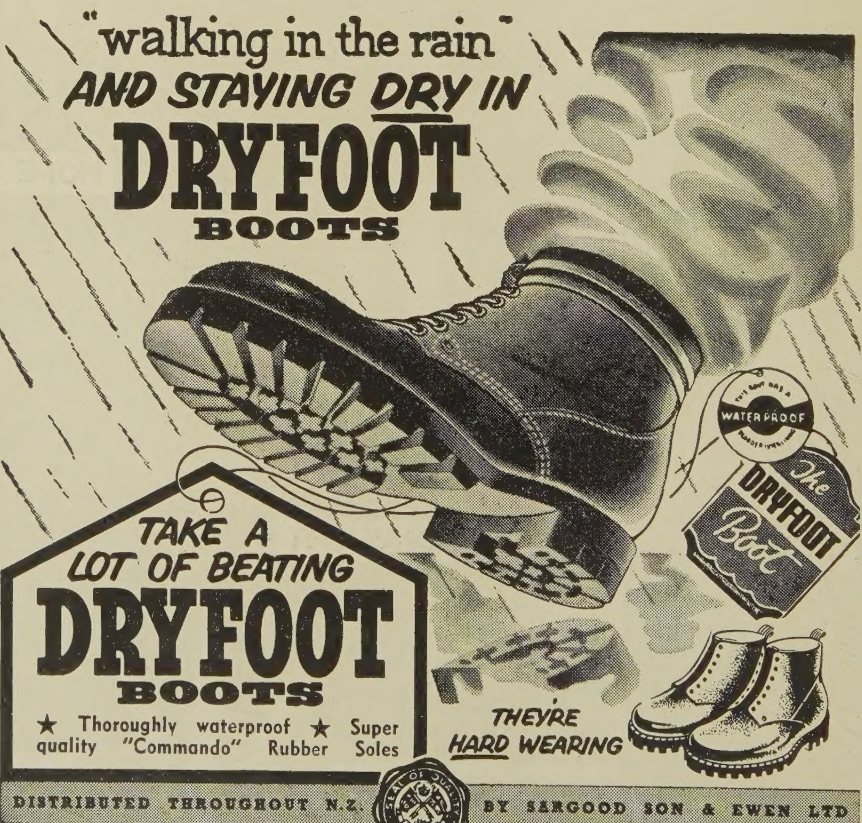

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the yield of Cross 7 in individual trials has ranged from 21 bushels to 95 bushels per acre. Trials conducted in the 1952-53 season have been excluded from the following summary of results, as the Cross 7 plots that season were affected severely by diseases and consequently gave very low yields.

In the comparisons of Cross 7 and 313,01 the difference in yield between the two varieties is expressed as a percentage of the yield of Cross 7 in individual trials, these percentages being averaged to make an over-all comparison. Cross 7 yielded more than 313,01 in only two of the 98 trials, the yield of 313,01 ranging from 2 per cent. less to 67 per cent. more than that of Cross 7.

The average of these percentage increases gave an over-all increase in favour of 313,01 of 23 per cent.

Spring-sown Trials

Thirty-four of the above trials were spring-sown. Nineteen of these, sown in seven different seasons, were in Otago and Southland. In these trials the yield difference in favour of 313,01 averaged 24 per cent., with the difference in individual trials ranging between 7 per cent. and 54 per cent. A similar result was obtained from four North Island trials.

In Canterbury in three seasons 11 trials were spring sown. In these trials the average superiority of 313,01 over Cross 7 was 23 per cent., ranging in individual trials from 7 per cent. to 67 per cent. The yields of Cross 7 ranged from 21.6 bushels to 57.6 bushels per acre. It must be emphasised that spring sowing of wheat in Canterbury is not common and can lead to low yields.

From the results of all these trials it was clear that the bulk 313,01 could be expected to yield well, and to outyield Cross 7 under almost all conditions suitable for wheat growing in New Zealand.

Baking Quality

Samples of grain from all comparative trials of the bulk 313,01 were milled and baked at the Wheat Research Institute. Samples from the 1953 harvest were included, though it was expected that the Cross 7 plots, which were poor in yield, would have a baking score higher than average. A summary of the baking-quality tests of the bulk 313,01, excluding 1953 results, shows that of the 107 samples baked over the eight seasons 44 were inferior to Cross 7 and 12 were better. It was considered unwise to release such a high-yielding line to replace the most important New Zealand variety without making a search, within the bulk material, for higher baking quality.

Grain of Aotea wheat.

The Reselection

A lactic-acid flour sedimentation test, developed by Dr. L. Zeleny, United States Department of Agriculture, for the grading of bulk wheat for quality was modified for use in the selection of small, single plant progenies. In 1952-53, 1000 single plants of the bulk 313,01 were grown as a nucleus for the production of pure seed, and their progenies were grown in the following year. Progenies not typical of the bulk material and those obviously low yielding or infected with leaf diseases were rejected. The remaining 668 progenies were tested, and ten with the highest sedimentation-test scores were retained. In the next year the residues of seed from these ten progenies were sown to provide grain for a baking test. The baking scores of the test loaves were all higher than the baking score of the unselected bulk 313,01.

In one large replicated field trial in 1955-56 every selected line yielded more than the unselected bulk, which itself outyielded Cross 7 by 21 per cent. Several of the selected lines were similar to Cross 7 in baking quality. The grain harvested from this trial was used as seed for an extensive series of trials conducted in 1956-57 by the Department of Agriculture, though there was insufficient seed of some selections to enable them to be included in all trials.

Yields of Selections

In 14 trials on Cross 7 wheat land five of the original ten selections were compared with both Cross 7 and bulk 313,01. In this series Cross 7 averaged 58 bushels per acre and was outyielded by the bulk 313,01 (yielding 76 bushels) by 30 per cent. In individual trials the increase ranged from 5 per cent. to 69 per cent. The five selected lines all outyielded Cross 7 in each trial, while their average yields in all trials were between 3 per cent. and 7 per cent. greater than that of the bulk 313,01.

The same five selections were included in seven trials on Dreadnought wheat land in comparison with Arawa and bulk 313,01. In this series Arawa averaged 82 bushels per acre, and the bulk 313,01 averaged 90 bushels. The five selected lines gave yields with averages ranging between 1 per cent. and 4 per cent. higher than those from bulk 313,01.

The other five selections, of which a smaller quantity of seed was available, were included in trials alongside six of the trials mentioned above as being on Cross 7 wheat land. In these trials, where no direct comparison with Cross 7 was possible, the bulk 313,01 averaged 78 bushels per acre, and the average yield of each of the five selections ranged from 3 per cent. to 6 per cent. higher.

Observations on Selections

There was only one failure in the 26 trials which included selections from 313,01. This was at Fernside, where the whole trial was seriously infected with disease. There was no lodging or shattering in bulk 313,01 or the selections. The bulk line could be distinguished from the selections because of its greater variability in height and maturity, while the selections were even in type. Selection 6 was slightly shorter than the others, and in the trials at Seadown, Coonoor, Kokoamo, and Totara had more fusarium ear blight. In Canterbury there was little difference in maturity between Cross 7, bulk 313,01, and the selections, but in Otago and Southland Cross 7 was distinctly later.

Milling and Baking Quality

Samples of grain from all comparative trials of the selections were milled and baked at the Wheat Research Institute. In milling quality the selections as a group were slightly inferior to Cross 7, but were equal to or better than other New Zealand wheats. The baking quality of all wheat from the 1957 harvest was high. Generally baking quality of the selections was equal to or better than that of wheat imported from Australia, but still not quite as good as that of Cross 7. It is expected that in an unfavourable season the baking quality of Aotea will remain similar to that of Cross 7 and will not have the weakness shown by Arawa in 1956.

Release of Aotea

In April 1957 the Wheat Research Committee, after consideration of the results of the yield trials and baking tests of the reselected lines, decided that these should be combined and released to growers as the new wheat Aotea. The committee also agreed that to make seed more readily available while stocks of pure seed were being multiplied the seed of the reselections harvested from field trials could be grown by the co-operating farmers as the first commercial crops of the new variety.

Description of Aotea

In most agronomic characters Aotea is very similar to Cross 7, but in the early stages of growth it is more prostrate and the leaves are a darker green. The main characteristics of Aotea, compared with those of Cross 7, are:—

Growth type: Erect, similar to Cross 7.

Tillering: Tiller production is low, as in Cross 7, but more tillers survive to form ears.

Heading: Three days later than Cross 7 (at Lincoln).

Ripening: Similar to Cross 7 (at Lincoln).

Straw: Shorter than Cross 7, golden in colour.

Head: Slightly longer than Cross 7, moderately tapering and tip awned.

Chaff: Smooth, very light brown, rather glossy.

Glumes: Mid-long and mid-wide, of rather stout appearance, beak short.

Grain: White; cannot be distinguished from Cross 7.

Lodging: Resistant; equal to Cross 7.

Shattering: Resistant; equal to Cross 7.

Loose smut: Susceptibility similar to Cross 7.

Leaf and stem rust: Slightly more resistant than Cross 7.

Mildew: More resistant than Cross 7, but less resistant than Dreadnought.

Root diseases: More resistant than Cross 7.

Yield: High; more than 20 per cent. increase in yield over Cross 7.

Milling quality: Slightly inferior to Cross 7.

Baking quality: Almost equal to Cross 7.

Seed Supplies

Seed of Aotea wheat is being made available as rapidly as possible.

In those 1956-57 trials where the header was used for harvesting the officers of the Department of Agriculture kept the grain from the selection plots separate from that harvested from the Cross 7 or Arawa plots and the surrounding crop.

The seed from the selections was bulked and the co-operating farmers have been permitted to use it for sowing the first commercial crops of the new variety Aotea. A total of about 1000 bushels has been sown by growers from North Canterbury to North Otago. These crops will not be certified, but will be inspected by local officers of the Department of Agriculture with a view to advising on the suitability of the grain harvested for use as seed.

At least 27,000 bushels will be harvested in 1958, enough to sow 18,000 acres in the season 1958-59. On a conservative estimate the yield will be 800,000 bushels, and this would be 150,000 bushels more than that produced by an equal area of Cross 7.

The Crop Research Division has already passed over to the Extension Division supplies of nucleus seed of Aotea for multiplication and distribution under its seed certification scheme. Certified Standard Aotea seed wheat will be available for the 1959-60 season.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during December 1957 and for the 5 months ended 31 December 1957 with comparative figures for the same month and the 5 months of 1956 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
December 1957	25,593	399	25,992	—
December 1956	23,144	391	23,535	—
Increase	+2,449	+8	+2,457	+10.44
5 months ended 31/12/57	105,499	1,587	107,086	—
5 months ended 31/12/56	95,905	1,576	97,481	—
Increase	+9,594	+11	+9,605	+9.853

Butter in store at 31 December 1957 was 26,989 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
December 1957	11,839	2,029	13,868	—
December 1956	11,254	1,912	13,166	—
Increase	+585	+117	+702	+5.332
5 months ended 31/12/57	41,566	7,021	48,587	—
5 months ended 31/12/56	40,987	5,924	46,911	—
Increase	+579	+1,097	+1,676	+3.573

Cheese in store at 31 December 1957 was 21,436 tons

If these figures are converted into butterfat equivalent, there is an increase of 8.734 per cent. in butterfat graded for the 5 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

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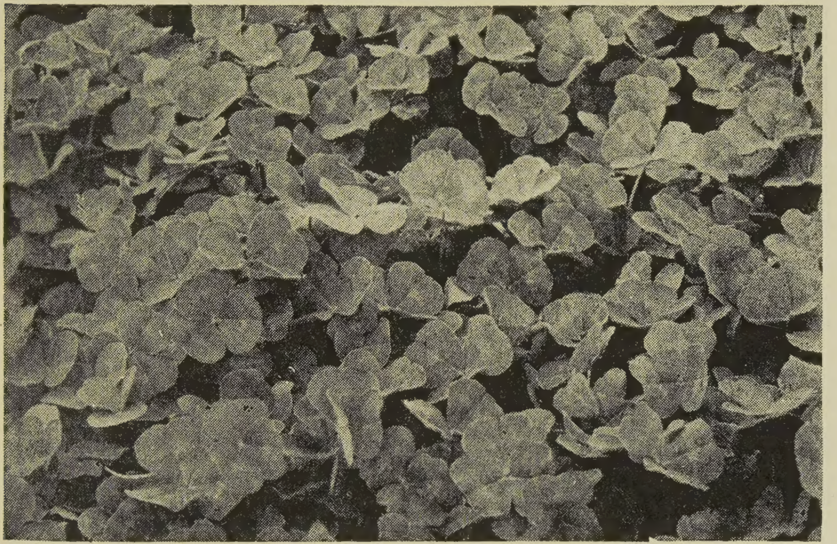
Seed Production in New Zealand

Subterranean Clover

By J. P. BEGGS,
Instructor in Agriculture, Department of Agriculture, Blenheim

SUBTERRANEAN clover has been grown for seed in New Zealand only relatively recently. When commercial sowings of this clover were begun in the Dominion about 25 years ago all seed was obtained from Australia, where it had been very popular for some years. However, it was not long before New Zealand growers turned their thoughts toward seed production, and though results in the early years were largely disappointing, some very satisfactory yields of seed were soon being obtained. Sound methods of seed production have now been evolved, methods which have been developed under and have proved suitable for local conditions.



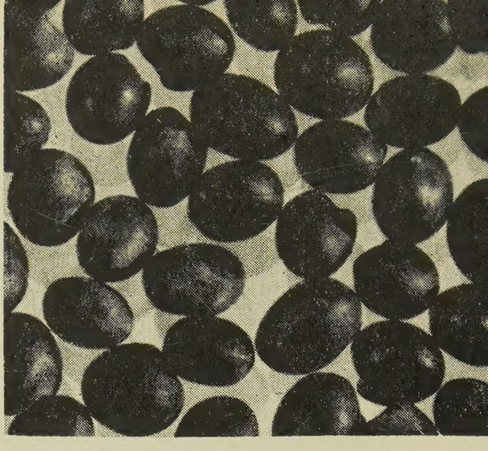
A dense growth of subterranean clover suitable for seed production.

DURING the past 25 years in New Zealand subterranean clover has risen from the status of an experimental plant to that of a proven friend to the farmer. It has proved particularly valuable on light to medium land where the higher-producing perennial clovers cannot persist and produce well, though it may also be regarded as a valuable adjunct to white clover on much medium-class land.

As a surface-sown plant in conjunction with the use of superphosphate it has proved the salvation of much hill country in the North Island. Because of its outstanding response to phosphatic topdressing it has made the topdressing of this type of country economic and on much land has facilitated the control of secondary growth. In the South Island it has proved a great fertility builder on light, shingly land and has allowed the establishment of permanent pasture on such land. It is also now giving good results as a surface-sown plant on some hill country in the South Island, though it has not been as widely used for this purpose there as in the North Island. In both islands it has proved an extremely valuable clover for the production of fat lambs.

Description of Plant

The subterranean clover plant (*Trifolium subterraneum*) is an annual, but because of its ability to re-establish itself by reseeding it is for practical purposes a permanent-pasture plant. In late spring or early summer the plant sends out runners which vary in length from a few inches to several feet, depending on conditions. In an established stand which has been closed for seed production these runners form a tangled mass which can cover the ground completely to a depth of a foot or more.



Subterranean clover seed (five times natural size).

The flowers are white and are borne on slender petioles or stalks which are usually 2in. to 3in. long. After fertilisation the flower gives place to a small burr which, when mature, is about 3/16in. in diameter. As the burr grows the stalk on which it is borne turns downward and forces the burr into the soil, but when the growth of herbage is heavy many burrs fail to reach the soil and remain suspended in the network of stems. Burrs coming into contact with loose soil often bury themselves completely and in dry ground many disappear in cracks.

The seed, which is dark purple, is usually two to three times as large as red clover seed and is tightly encased in burrs, from which it is rather difficult to dislodge at threshing. Each burr normally contains four seeds.

Two Strains Grown

Only two strains of subterranean clover are grown commercially in New Zealand and certified seed of both is being produced. One strain, known as mid-season, corresponds to the Australian Mount Barker strain; the other, designated late-flowering and corresponding to the Australian Tallarook type, flowers and matures later. It is generally recognised that seed is easier to harvest from the late-flowering than from the mid-season type, which tends to bury its seed in the soil to a greater extent.

Land from which subterranean clover seed is produced may be divided into two distinct classes: First, areas which have not been sown with a view to the harvesting of seed, or where seed production is incidental to grazing and which are occasionally closed for seed merely because favourable weather permits their temporary withdrawal from their main purpose of grazing. Secondly, paddocks that are sown down especially for seed production, with grazing a minor consideration.

In the earlier years of seed production practically all harvesting was incidental, but in later years the specialised type of seed production has increased markedly. This has been caused largely by a drop in the price of the seed, making heavier yields necessary to give a satisfactory return for the time and labour spent in harvesting.

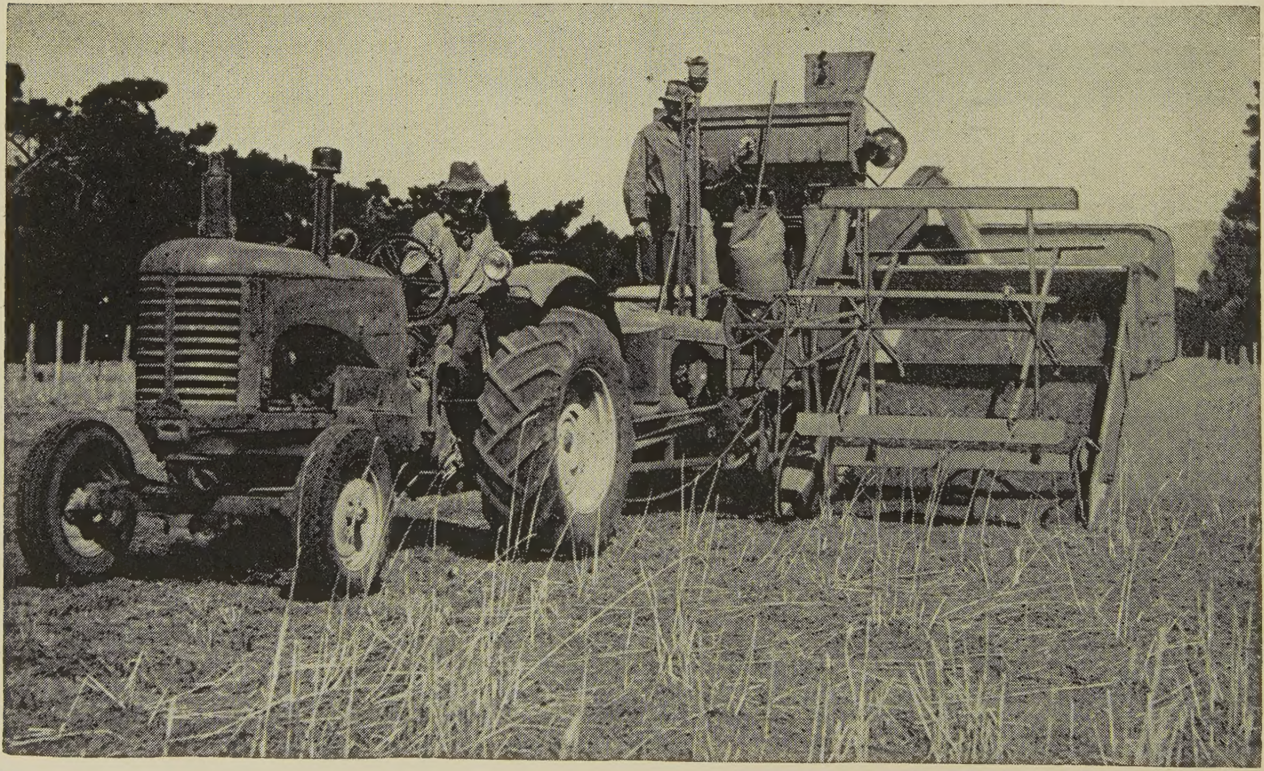
Soil Type and Climate

Subterranean clover will grow on a variety of soil types, but it grows most vigorously on light to medium friable soils. For satisfactory seed crops a heavy growth of herbage is important, as it increases the quantity of seed produced as well as preventing many of the burrs from reaching and penetrating the soil.

The aim is to secure, if possible, a growth of pure subterranean clover, as the presence of grass or foreign clover growth usually makes harvesting more difficult. On the better types of soil a pure stand is difficult to secure, for on such land foreign clover, grass species, and weeds are almost sure to be present.

Light to medium soil with a not-too-abundant supply of humus and nitrogen is ideal for the production of a good subterranean clover seed crop. Surface stones are highly undesirable, especially when a hay rake is used at harvest. If

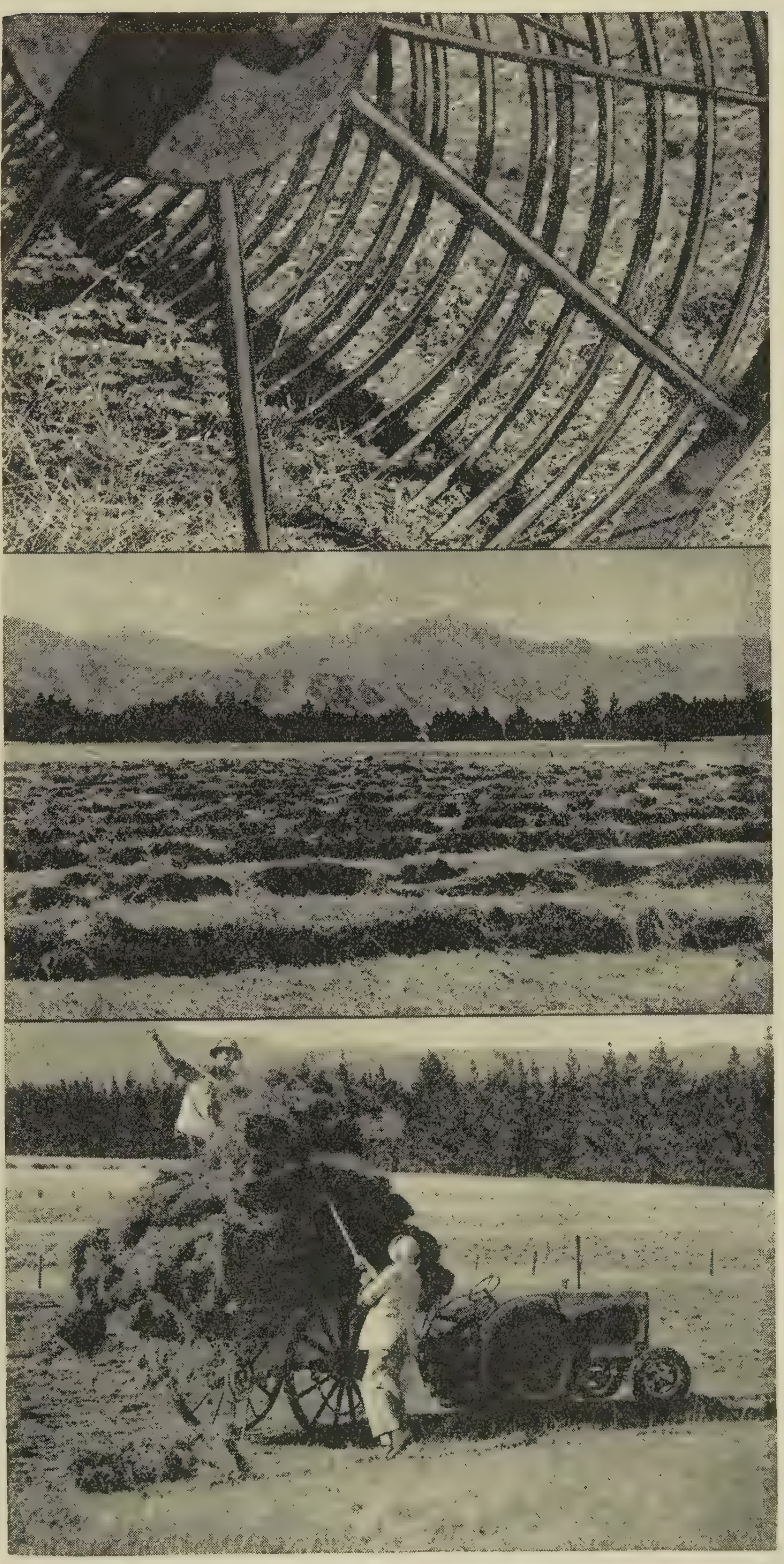
An ordinary header harvester when fitted with lifting fingers is able to harvest subterranean clover seed satisfactorily. Above—Part of a heavy crop forming a dense mat of herbage suitable for harvesting with a header harvester. Below—A header harvester at work in subterranean clover.



some stones are present in an otherwise-ideal paddock, the use of a heavy roller before the land is closed for seed followed by direct heading of the crop will overcome the difficulty.

A suitable climate is essential for both the growth of the crop and harvesting. For best growth of subterranean clover early autumn rains, a mild winter and spring, and a good supply of moisture in early summer are needed. Under such conditions the clover establishes early in autumn, grows slowly through winter, and is then able to grow vigorously in spring and early summer.

However, important as the growing period is, good harvest weather is equally essential, for heavy rain after the seed has ripened can cause germination of the seed and consequent loss of the crop. Therefore, reasonably consistent results from harvesting can be expected only in districts which are favoured with a settled, dry summer climate. Probably the most favoured district in this respect is Marlborough, where the best and most consistent yields of seed are obtained.



Where mowing is not practicable a subterranean clover seed crop is left to become dead ripe and then raked up when moist with a stiff-tined hay rake. Upper—A suitable type of rake for the work. Middle—Subterranean clover lying in windrows after being raked. Lower—A subterranean clover crop being carted to the stack after being raked into windrows.

Incidental Seed Crops

It is not intended to deal fully with methods of establishing subterranean clover in normal farming practice, as seed crops are taken from areas which have been sown in a variety of ways. The seed may have been sown with rape, turnips, oats, or grass, or in some other manner; perhaps after a few years the area has run to strong and dominant subterranean clover growth, and an abundance of feed on the remainder of the farm has induced the farmer to close this area for a seed crop. Again, the subterranean clover growth may have been indifferent for a number of years, but cultivation and an application of fertiliser or lime may have made possible the harvesting of a reasonable crop of seed.

Such crops can be regarded only as catch crops, as the farmer is taking advantage of favourable weather or other circumstances to secure an additional cash return. Of more interest for seed production are the specialised seed areas.

Specialised Production

For specialised seed production the clover is usually sown at a heavy rate, with or without a cover crop, the aim being to secure as rapidly as possible a dense and deep mat of clover, free from grass or other foreign growth. The rate of seeding for such areas usually is between 10lb. and 18lb. per acre. The seed is sown as early as possible in autumn if it is intended to harvest the seed crop in the first year.

A cover crop of barley or oats may be used and it is then desirable for the seeding to be carried out rather late in autumn. When such a cover crop is used it is necessary to drill the cereal first and then roll the ground to provide a reasonably fine, consolidated seed-bed for the clover. The cereal is harvested when mature, and the subterranean clover later.

However, though the cover crop method is quite successful, sowing the clover alone is desirable for specialised seed production. The ground should be worked early so that moisture will be conserved during summer, permitting early-autumn sowing despite dry conditions. When two crops are sown together one usually grows at the expense of the other, as was well demonstrated in one of the best paddocks in Marlborough in 1946-47. This area was sown first with a cover crop of barley and later with the clover. The final result was a very prolific growth of clover, but the barley was so smothered that no effort was made to harvest it. The clover crop yielded 750lb. of machine-dressed seed per acre, and it seems reasonable to assume that if a heavy crop of barley had been secured, the yield from the clover would not have reached that gratifying figure.

Nevertheless, much can be said for having a double chance when aiming mainly at subterranean clover seed production, for unfavourable weather just before harvest may destroy all chances of harvesting the clover.

Whenever subterranean clover is sown, whether for specialised seed production or not, both lime and superphosphate should be used. The lime should be harrowed into the seed-bed before the seed is sown, 1 ton per acre being a suitable application. The superphosphate should be sown with the seed at the rate of 1cwt. to 1½cwt. per acre. In sulphur-deficient areas the application rate should be raised to at least 2cwt. per acre.

Subsequent Management

On specialised seed-production areas subterranean clover stands normally are not grazed at all during the first year. In subsequent years a stand may be grazed lightly, but the securing of a deep mat of vegetation is extremely important if a good yield of seed is to be obtained.

No hard-and-fast rules can be laid down about grazing management, for this varies with the season. When the winter is mild a fair amount of grazing may be carried out without detriment; in other years little grazing might be obtained. The nature of the re-establishment in autumn has an important influence.

It had been found that two good crops of seed were seldom secured from one area in successive years, but recently it has been shown that suitable cultivation after the harvesting of the first crop results in an equally successful succeeding crop. This has been strikingly demonstrated in Marlborough. A paddock which produced a crop of 750lb. of machine-dressed seed per acre was disced, harrowed, and rolled after harvest, a dressing of 1 ton of lime and 1cwt. of superphosphate being applied after the discing. The area was saved for seed the following season and the outstanding yield of 1260lb. of machine-dressed seed per acre was obtained.

Cultivation of established stands of subterranean clover in the autumn of the season before seed is harvested undoubtedly will greatly increase the vigour of the clover, with a corresponding influence on the yield of seed. This recommendation applies equally to ordinary grazing stands of this clover, and both feed and seed production could be increased greatly by extending this type of work. The application of superphosphate and lime at this time is also an important factor in increasing production from the clover.

After a few years' vigorous growth of subterranean clover in a paddock grass begins to grow, and as the fertility of the soil improves the proportion of grass to clover increases. This is highly desirable on ordinary grazing land, but in seed-production areas it is a hindrance at harvest time. A pure clover sward is best for the production of a good seed crop.

When grasses invade a seed-producing paddock it is desirable to remove them. Cultivation alone aids greatly, but it is more common to take advantage of the built-up fertility by taking a crop or two. Quite often after a few years of vigorous clover growth it is possible to take a wheat crop from the area. This serves the double purpose of providing a good cash return and reducing fertility, with the result that clover growth rather than grass growth is again favoured.

If cultivation is managed so that the final ploughing returns the bulk of the clover seed to the top of the furrow, resowing will not be needed. It will merely be necessary to cultivate in autumn to produce a suitable seed-bed. The application of 1 ton of lime and 1cwt. to 2cwt. of superphosphate at this time would also be highly desirable, both being harrowed lightly into the seed-bed.

Harvesting Methods

Subterranean clover is well known for the difficulties it presents to the harvester of its seed. Unlike most annual plants, it does not merely shed its seed on the surface of the ground but tends to bury the burrs containing the seed. In loose soil much seed is forced into the ground, but when the surface is hard most of the burrs remain at ground level, apart from those which penetrate small cracks or other soil irregularities. The persistence of the clover in the face of adverse weather is really the result of this tenacious manner of reseeding.

Weather is another factor which can make a subterranean clover seed crop very difficult to harvest. If prolonged rain falls after the seed has ripened and just before harvesting is to begin, the seed germinates and thus makes harvesting impracticable.

Many different harvesting methods have been evolved in New Zealand and Australia. None is completely efficient, but some recent operations carried out under ideal conditions have proved very effective. The methods used in Australia differ from those which have been evolved in New Zealand. The cultivation of the surface soil as a harvesting operation appears to be much more common there than in the Dominion. A roller covered with sheepskin has been widely used to collect the burrs, several runs being made over the same area, with harrowing between runs to bring a fresh batch of burrs to the surface. Another method is the grading of a thin layer of surface soil into rows, the burrs being later separated from the soil so gathered.

In New Zealand several methods have been used with varying success. One of the earlier machines tried was the chain drum stripper, but results were relatively poor and this method has never been used widely. It had the disadvantage of adding much soil and other foreign matter to the seed.

Other crops have been cut and harvested like an ordinary hay crop, the material being stacked, baled, or threshed from the paddock. A header or clover huller is used for threshing, the straw being put through twice to secure efficient threshing. A very deep mat of growth to hold a proportion of the burrs above ground level is necessary if this method of cutting is to result in a reasonable yield of seed.

A later method was the fitting of lifting fingers similar to but smaller than pea fingers to the cutter bar of the mower. This was a great improvement on the ordinary mowing gear, as the fingers lifted the burrs clear of the ground in front of the blade. In this method the crop is allowed to become dead ripe before it is cut, but to avoid breaking the stalks bearing the burrs it is advisable to cut the crop when it is bearing light dew or other moisture. After being dried the material is collected and later threshed. Again either a header or a clover huller is used, though the huller gives best results. A period in stack makes for easier threshing, though the straw usually has to be put through twice for satisfactory threshing.

Another implement commonly used in the harvesting of subterranean clover seed is the stiff-tined hay rake. After the crop has become dead ripe the herbage is allowed to become moist with dew or light rain to strengthen the fragile stems which bear the burrs. The material is merely raked where it grows, no mowing being done. Any burrs having a loose hold on the soil are dragged out in the raking. The material is then allowed to dry thoroughly in the windrow before it is threshed, though again a period in stack might facilitate threshing and improve the yield of seed.

Threshing is done with a header or clover huller. Whether the herbage has the correct degree of moisture in it before it is raked can be judged only by experience. Just sufficient to toughen the stems is required. If the material is raked when it is excessively moist, a protracted drying period in the windrow is necessary. Some farmers rake when the crop is quite dry, and though the loss of burrs is greater, quite reasonable yields of seed may be obtained.

Direct Heading

The labour shortage of recent years has led to the adoption of many short cuts in farming methods, and perhaps the header harvester has been responsible for more labour saving than any other farm implement during this time. Certainly the farmer now uses this implement for harvesting at every possible opportunity. Though until a few years ago nobody would have considered it possible to harvest subterranean clover seed with this implement by direct heading, this operation has now been established as very satisfactory, giving excellent results if conditions are suitable.

For successful direct heading the paddock must carry a good, deep mat of growth. Under such conditions many of the burrs are prevented from reaching the soil and the lifting fingers are provided with a good bulk of growth on which to work. This is important in direct heading, as an even flow of material up the canvas and into the drum promotes efficient threshing. With an uneven, "broken" type of crop the clover is inclined to enter the drum in lumps instead of in the form of a mat, and then much seed is lost through inefficient threshing. Short, thin crops or those that are markedly uneven are harvested more satisfactorily by some other method, such as raking.

For direct heading the header is fitted with special lifting fingers which lift most of the burrs clear of the approaching knife. The lifters, which are attached to the fingers of the cutter bar, slide the clover gently up on to the canvas and thence to the drum. In a suitable, even, heavy crop the canvas has little part in conveying the material upward; it is drawn directly from the lifters to the drum in the form of a carpet or mat, the main lifting force coming from the drum. The lifters may be attached to every finger or to alternate fingers; if stones are likely to be encountered, the latter setting is advisable to reduce the likelihood of picking them up.

Subterranean clover to be direct headed must be dead ripe and dry. Warm, dry winds greatly facilitate threshing. The setting of the header is much the same as for threshing red clover except that the finishing riddle is slightly larger.

In earlier direct heading attempts in Marlborough an extra concave made up of clover huller rasps was fitted to the header with the object of promoting threshing efficiency. This fitting caused damage to the seed until the rasps became worn. Now the ordinary standard header is used and gives satisfactory results without the extra concave.

Provided the header is allowed to travel very slowly, surprisingly good results may be obtained by direct heading. One farmer using this method in the Marlborough district secured the astonishing yield of 1260lb. of machine-dressed seed per acre from a 14-acre paddock. This yield was obtained by putting the material through the header only once. Threshing thoroughly and slowly once is more satisfactory than threshing twice less thoroughly.

Very slow travelling by the header is of vital importance. If progress is too fast, seed is lost through breaking of the seed stalks and inefficient threshing.

Yield

Yields secured from subterranean clover seed crops are so variable that it would be impossible to state a figure for an average or normal yield. The yields of 750lb. and 1260lb. per acre from one paddock in successive years are outstanding, but they indicate what can be achieved. However, under good seasonal conditions and good management a yield of up to 500lb. of machine-dressed seed per acre of the late-flowering strain could be expected.

Machine Dressing

Because of its resistance to threshing subterranean clover seed is likely to be damaged during this operation. Shelled and chipped seed is therefore common in some lines, and it is not possible to remove by machine dressing all seed damaged in this way.

Many lines of seed show a low percentage of purity because of damage during threshing, and farmers should give this special attention when dealing with subterranean clover seed. A common mistake is to allow considerable quantities of seed to return to the drum in an effort to secure the maximum of threshed seed. It is better to allow some seed to pass into the bag partly threshed than to ruin the whole line through over-threshing. Partly threshed seed often may be cleaned satisfactorily at machine dressing by using the polisher.

Rape and wild turnip seed cannot be completely removed from subterranean clover seed at machine dressing, and it is a mistake to save an area for seed if it has any quantity of these impurities in the crop. Seeds of vetches are also impossible to remove completely. Striated clover is often associated with subterranean clover stands, and it is impossible also to eliminate this from the seed.

The most common impurity to be dealt with during dressing is small particles of soil of about the same size as the seed. However, though its elimination may occupy considerable time during dressing, it can usually be dealt with satisfactorily.

Seed Certification

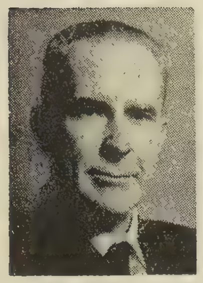
Certified seed was first produced in New Zealand in the 1938-39 season. For an area to be eligible to produce certified seed it either must have been sown with New Zealand certified seed or with Certified Mount Barker (including West Australian Mid-season) or Tallarook seed from Australia, or a sample of a previous harvest of the area must have revealed a satisfactory standard under plot test. In addition, the area is subject to a field inspection at flowering time to determine the strain purity of the crop.

Future of Industry

To forecast the future of subterranean clover seed production in New Zealand is difficult. However, it is obvious that this clover has proved very valuable in many parts of the country, and its use has become very widespread in only a few years. Without doubt it will continue to be popular and a continual supply of seed will be required. Surface sowing from aircraft is setting up a still greater demand for seed.

Therefore, it seems likely that a good demand for this seed will continue in New Zealand. High-quality seed can be produced economically in the country, and while this is so it is reasonable to expect that districts which are favoured with suitable soil and climate will produce subterranean clover seed as part of their normal farming practice.

Encouragement of Efficient Farm Production



THE recent announcement of an increase of 2s. per bushel in the price to be paid to farmers for the production of wheat is indicative of the Government's determination to do everything possible to encourage a better balanced production programme and to stimulate farmers to help overcome the difficulties New Zealand's economy is facing.

As is inevitable in an economy based so largely on agricultural production, farmers will be relied on for a substantial part of the effort required if we are to emerge from our difficulties, as I have no doubt whatever we will. As Minister of Agriculture and Lands I accept my share of the responsibility to see that producers have the means to meet the present situation, and I am confident they will respond to the need to increase production and make some changes in management to meet the requirements of overseas and domestic markets.

More Wheat, Better Pastures

The need to return to a reasonable annual acreage of wheat has long been evident and the new increased price should encourage arrest of the serious decline of recent years.

Raising the area sown to wheat from the present 65,000 acres to 150,000 acres could mean a saving in overseas exchange of £2,000,000 to £2,500,000.

Such substantial increase in the wheat acreage should not result in any decrease in the production of other annual cash crops, fodder crops, lamb, and wool. Rather should it increase the area of young and vigorous pastures resulting from the more rapid turnover in rotations that increased wheat production would entail in arable farming districts. These highly productive young pastures would more than compensate for the loss of old grass turned over for wheat.

To meet as fully as possible all food requirements of the local market and to increase our overseas exports of meat and wool should be the immediate general aim in farm production. A country that is an acknowledged leader in the production of food of high quality should have little occasion to be other than self-sufficient in regard to domestic requirements. As we are so fitted for this type of production and our other resources are limited, we have little alternative to continuation of the expansion of our production of animal products for export.

Hill Country Improvement

The hill country pasture improvement that has been possible with the use of recent techniques of aerial oversowing and topdressing must be pressed on with as an important means toward obtaining the production needed. I want to help hill country improvement as rapidly as possible. The Department of Agriculture has been demonstrating the pertinent methods very widely, particularly in backward districts, and the Marginal Lands Board has given substantial financial assistance to capable land improvers.

I want to encourage both these agencies of land improvement to maintain a vigorous and expanding programme. New methods of chemical pre-treatment and overdrilling developed by agricultural research workers and described in recent issues of "The Journal of Agriculture" show great promise for the economical and rapid establishment of good pastures, particularly on unploughable and problem country in poor pasture or weed infested.

Land Development

A great deal of unimproved ploughable scrub land still remains to be developed. Every year 65,000 acres are being grassed by the Departments of Lands and Survey and Maori Affairs. Developed blocks are being subdivided into economic dairying and sheep farms and offered for farmer settlement. I will encourage continuation of this valuable work to the full extent of the resources of the two Departments. Private land development, which has also brought considerable areas into production, will continue to receive financial assistance from the Marginal Lands Board and the State Advances Corporation.

New Markets; Diversified Production

The search for new markets will be prosecuted vigorously in the effort to help the dairy industry in its present difficulties. The problems presented by competition in our traditional markets from disposals by other countries of their surplus dairy produce are being continuously studied, and defence of our producers from these threats to our markets is considered of major importance.

Diversification of production on dairy farms is a defensive measure that producers themselves could give more attention. Pork, bacon, and veal production is an obvious method of dairy farmers ensuring that all their eggs are not in one basket.

Research and Animal Diseases

Research and extension work of the Department of Agriculture and efforts to improve the control of livestock diseases like facial eczema and tuberculosis that cause serious economic losses in production will be intensified.

A better advisory service in the control of facial eczema should result from the establishment of the district committees recently announced, and the advisory committee on facial eczema research can be expected to give worthwhile leads to maintenance of the progress being made toward a solution of this complicated and worrying disease.

Eradication of tuberculosis from factory herds should be advanced by the setting up of an advisory committee to operate a scheme of voluntary tests.

To ensure that meat is processed and packed to the exact requirements of overseas markets, the meat inspection staff of the Department of Agriculture is being increased.

The best technical advice and the means for full and efficient production are essential to the farming industry at any time, and are particularly important now. I intend to see that farmers are not short of the means necessary to their effort and that the high quality standards set for our export products are maintained. I am sure that if we can ensure these requirements, our present pressing problems will be well on the way to solution.

—C. F. SKINNER, Minister of Agriculture

Overdrilling Greenfeed Cereals

By M. W. CROSS, Senior Lecturer in Farm Machinery, and R. H. SCHWASS, Senior Lecturer in Field Husbandry, both of the Field Husbandry Department, Massey Agricultural College, Palmerston North

CONSIDERABLE success has been achieved during recent years through the use of the overdrilling technique of renewing or improving pastures by the introduction of seed and fertiliser directly into the existing sward or crop stubble without the preparation of conventional seed-beds. Suitable machinery is gradually being developed both in this country and overseas, and the growing body of literature on the subject is leading to agreement on the main principles of successful methods. Research work being conducted by the Extension Division of the Department of Agriculture and others concerns the furtherance of this technique both with and without chemical sprays, and results so far suggest that a considerable reduction in the extent of preparatory cultivation may be possible with many crops.

THE more widespread acceptance by farmers of this practice is restricted in many cases by the necessity for purchasing specialised equipment. If additional profitable employment for this equipment could be developed, thus spreading the initial cost over a number of jobs, such limitations would be minimised. Alternatively, if current equipment could be modified satisfactorily, more widespread use of the method would be encouraged.

A successful development in the U.S.A. has been a system of double-cropping, whereby a crop of soya beans is drilled directly into the stubble of a wheat crop and harvested the same season. This production of two crops from the same ground in the one season, with no increase in cultivation costs, provided the inspiration for similar investigations at Massey Agricultural College. In 1956 an exploratory trial was undertaken to examine the possibilities of overdrilling greenfeed crops in autumn into the stubble of preceding arable crops immediately after their harvest. In these trials, with several varieties of greenfeed cereals sown into a wide range of summer crop stubble, the method appeared both workable and promising. Results of this trial and the impressions gained from it were published in the "Massey College Sheep Farming Annual 1956".

Last year a further trial was laid down at the college to compare the yields from greenfeed crops sown into a prepared seed-bed and overdrilled directly into a crop stubble.

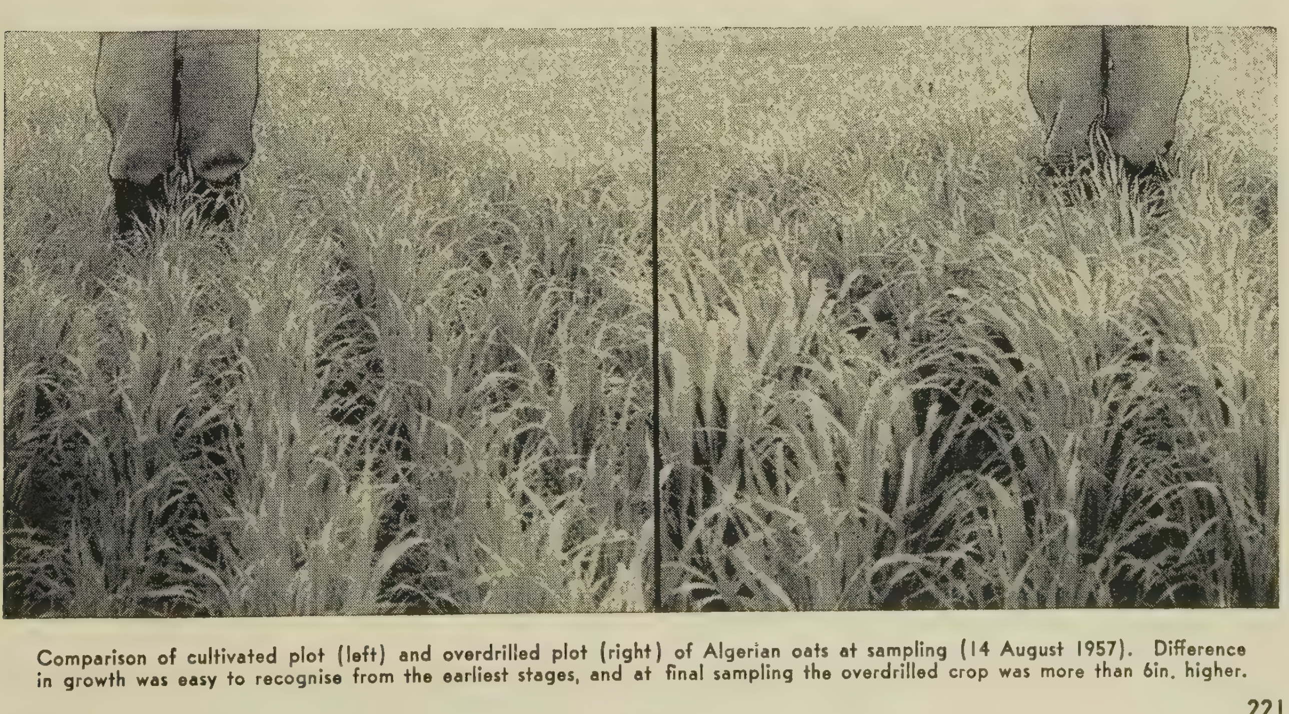
Experimental Procedure

Block 4 (about ¾ acre) of the field husbandry area at Massey College was under a greenfeed maize variety trial in the summer of 1956-57. As this trial was the third successive crop grown on the block, soil fertility was not high; the mean maize yield (leaf plus stem) was 7600lb. of dry matter per acre from nearly 4 months' growth. The maize trial consisted of six replicated blocks with the maize drilled in 14in. rows. A broadcast dressing of 3cwt. per acre of an ammonium nitrate-calcium carbonate fertiliser (20.5 per cent. nitrogen) had been applied to all plots on 13 February 1957.

Immediately after sampling on 25 March 1957 the area was cleared by cutting the maize with a mower and picking up with a forage harvester. Little crop residue remained. The stubble was about 2in. high and fairly free from weeds, as the maize had been sprayed with the amine salt of 2,4-D in the early stages of growth.

The area remained untouched until 17 April 1957, when half of each replicate (taken at right angles to the maize rows) was ploughed to an average depth of 7in. Two double discings, one stroke of tine harrows, and two rollings were necessary to prepare a conventional seed-bed. The other half of each replicate was left in standing maize stubble.

On 18 April 1957 all plots were drilled with Algerian oats and C.R.D. ryecorn, using the split-plot layout shown in the diagram on page 223. Drilling, at about 1½ bushels per acre with 2cwt. per acre of serpentine superphosphate, was done with an Australian sod seeder which had been donated to the college for research. Row spacing was 9in. and depth of



Comparison of cultivated plot (left) and overdrilled plot (right) of Algerian oats at sampling (14 August 1957). Difference in growth was easy to recognise from the earliest stages, and at final sampling the overdrilled crop was more than 6in. higher.

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"PRIMARY PRODUCTION IN NEW ZEALAND"

THE Department of Agriculture's publication "Primary Production in New Zealand" is a particularly useful reference book. The fourth (1957) edition of this book, which was published recently, is available from main offices of the Department of Agriculture for 2s. 6d. per copy.

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planting about 2in. The seed was covered by trailing chain harrows behind the sod seeder.

During the period of fallow (26 March to 17 April 1957) the weather was bright and sunny with a total of only 0.4in. of rain, but in the 7 days after sowing 3.10in. of rain was recorded.

Results

Germination in all plots was good. Over the first 3 months from sowing the Algerian oats made much greater growth than the ryecorn, which remained prostrate and stunted (less than 2in. high). (Poor growth of this crop at the college has been usual with sowings delayed until after the first week in April.) It was quite easy to recognise the overdrilled from the ploughed oat plots from the earliest growth stages until the final sampling date, when the former was more than 6in. higher. This followed the pattern of the exploratory sowings of the previous year.

The first yield measurements were taken on 14 August 1957. An area of 27 sq. ft.—three 9in. rows each 12ft. long—was cut from each plot of oats with shears and weighed. A sample from each plot was dried to determine the total dry matter percentage, and the dry matter yield of each sample calculated. No measurements were made of the ryecorn, as it was still very stunted and prostrate.

A second yield measurement, using the same methods but this time of both oats and ryecorn, was recorded on 25 September 1957. Both crops had made vigorous growth and were just starting to shoot. Weed growth had been effectively suppressed by the more vigorous growing oats and all these plots were relatively clean. In the ryecorn plots weeds, though very evident in both the overdrilled and cultivated sections, were being overshadowed by the rapid spring growth and were not considered likely to cause serious competition.

Actual yields, converted to a per-acre basis, and dry-matter contents are set out in Table 1. At the first cut the green weight from the overdrilled crop was nearly double (97 per cent.) that from the ploughed plots, but the difference was reduced to a 68 per cent. increase on the dry-weight yields. The slower growth of the oats on the ploughed plots is clearly shown in their total dry-matter percentage, which is about 3 per cent. greater than that measured in the faster growing, overdrilled oats.

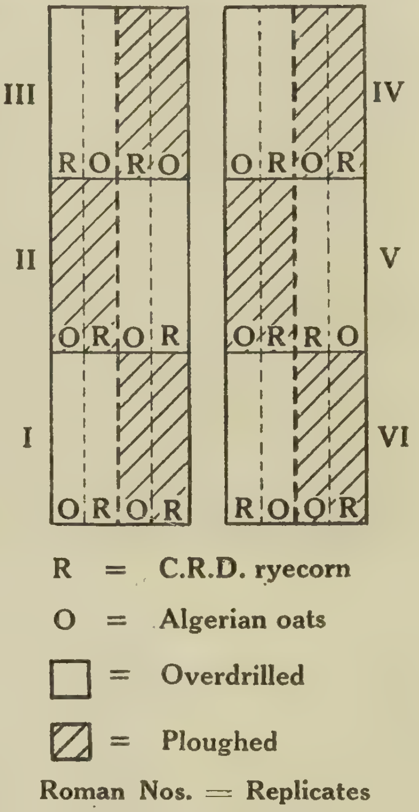
At the second harvest the stage and rate of growth of the oats was more nearly the same, the overdrilled plots outyielding the ploughed ones by only 26 per cent. on green weight and 20 per cent. on dry weight. The difference in dry-matter content was only 1 per cent. Ryecorn yields were very similar with each sowing method.

A statistical analysis of these results showed that at the first harvest overdrilled oats yielded (both green and dry weights) highly significantly more (.01 level of probability) than oats in the cultivated seed-bed. At the second harvest the green weight of the overdrilled oats was better than the oats on ploughed plots, at about the .02 level of probability, but the dry weight failed to reach significance at the .05 level. With ryecorn there were no significant differences between the sowing methods in either green or dry weights.

Discussion of Results

It must be realised that sweeping conclusions can never be made from only one trial under one set of conditions in one season, but the results reported as well as the experiences of the previous season suggest that the autumn overdrilling of a greenfeed cereal into the stubble of a preceding summer crop warrants further consideration as a useful technique. It provides another avenue for the employment of overdrilling machinery, it saves the costs of ploughing and normal cultivation, and, on larger areas particularly, because overdrilling is a once-over operation compared with the many hours required for cultivation, it reduces the time a field is out of production. This trial also shows that overdrilling can give equal or largely increased yields.

It is clear that two factors operated in this trial which could have penalised the overdrilled treatments.



Layout of trial comparing methods of sowing greenfeed cereals in autumn.

In the first place the maize crop had been cut and carted off the area, as had summer crops in one other preceding year (1954-55). Kale varieties grown during 1955-56 and grazed in situ in the winter of 1956 represented the only return of animal residues to this block since its ploughing in spring 1954. One advantage which would be expected from overdrilling a fed-off forage crop would be a response to the readily available nutrients returned by the stock to the surface layer of soil. Ploughing turns these under the surface and it is believed that much of their fertilising value is dissipated, at least on many soils which are not naturally of high fertility. This block had been ploughed before the maize sowing in spring 1956.

TABLE 1—YIELDS PER ACRE AND DRY-MATTER CONTENTS AT EACH HARVEST OF CEREALS ON PLOUGHED AND OVERDRILLED AREAS (sown 18 April 1957)

Date of harvest	Variety and method	Green weight tons per acre	Dry weight tons per acre	Dry matter per cent.
14/8/57	**Algerian oats:**			
	Overdrilled	5.93	1.06	17.8
	Ploughed	3.00	0.63	21.0
	Per cent. increase of overdrilled over ploughed	97	68	—
25/9/57	**Algerian oats:**			
	Overdrilled	14.17	2.73	19.3
	Ploughed	11.24	2.27	20.2
	Per cent. increase of overdrilled over ploughed	26	20	—
25/9/57	**C.R.D. ryecorn:**			
	Overdrilled	3.08	0.59	19.3
	Ploughed	3.00	0.58	19.3
	Per cent. increase of overdrilled over ploughed	3	2	-

The second factor lies in the timing of the sowings. Overdrilling can be carried out **immediately** the preceding crop is finished or harvested. Ploughing and seed-bed preparation involve an indeterminate delay of the sowing date, depending on the area involved and the weather. In many cases this time lag is critical, and many farmers are faced with a choice between a good seed-bed but late sowing, or sowing earlier on a poor seed-bed. The results obtained with ryecorn in this trial show that a late sowing can be detrimental to crop growth.

In a dry season each cultivation will further dissipate the already low soil

One of the replicates, with the prepared seed-bed on the left and the overdrilled area on the right, photographed 6 days after sowing (18 April 1957).

moisture. Though there may be sufficient moisture for the germination of an overdrilled crop, seed sown in a cultivated seed-bed may remain dormant until after rain. These conditions were reported in a trial comparing methods of pasture establishment (Massey College Sheep Farming Annual 1956).

In the present case sowing was carried out on the same day. The trial thus ignores any advantage in yield that could have been attributed to an earlier sowing date and is really a test of the cultural features of the two methods. The results do not indicate any inherent disadvantage of overdrilling a greenfeed crop in comparison with the conventional method of sowing into a cultivated seed-bed.

Because of the promising results obtained during both these trials this method of sowing is considered well worth a try-out on any property where such crops are grown. Some farmers prefer to give the stubble a surface cultivation instead of ploughing. This tends to dissipate moisture and encourages greater weed growth than occurs with overdrilling. Further, any regrowth from the crop stubble which could provide extra feed with the overdrilled crop is killed off.

As far as specialised machinery is concerned, any machine used for overdrilling pastures would be quite satisfactory, as would any conventional disc drill. Hoe coulter drills may be used provided there is little crop residue to cause blockages and the ground is not so hard that penetration is restricted.

Meteorological Records for January

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	65.4	+ 0.5	84.6	40.7	3.94	8	— 0.56	2.88	8	213
Auckland	160	66.0	— 0.4	82.5	49.9	1.32	8	— 1.86	0.59	17	227
Tauranga	10	64.1	— 0.5	84.0	43.0	0.89	5	— 3.05	0.47	17	276
Ruakura	131	61.6	— 1.5	83.3	39.1	1.65	6	— 1.83	0.73	17	217
Whakarewarewa ..	1006	61.9	— 0.7	83.3	39.7	1.70	8	— 2.83	0.86	17	251
Gisborne	14	66.2	+ 1.4	90.9	40.0	0.98	10	— 1.56	0.59	18	289
New Plymouth ..	160	61.2	— 1.0	73.0	41.8	4.44	9	— 0.03	1.33	6	197
Karioi	2125	58.2	+ 1.2	80.0	33.0	2.38	10	— 1.30	0.93	5	
Napier	5	66.7	+ 1.2	90.1	45.0	0.49	6	— 2.12	0.29	17	278
Wanganui	72	62.2	— 1.3	80.8	45.0	3.27	8	+ 0.49	2.73	16	220
Palmerston North ..	110	62.6	+ 0.2	80.7	40.6	3.17	14	— 0.03	2.03	16	175
Waingawa	340	62.6	+ 0.2	85.0	38.5	1.26	10	— 1.14	0.29	16	264
Wellington	415	59.8	— 1.2	71.6	46.3	5.42	11	+ 2.34	1.83	4	217
Nelson airfield ..	5	61.4	— 0.2	84.1	42.2	1.30	8	— 1.54	0.62	4	260
Blenheim	12	63.3	+ 0.7	88.1	40.4	1.81	9	— 0.18	0.59	4	286
Hokitika	15	56.5	— 1.6	71.0	39.8	20.38	19	+ 10.66	8.58	23	190
Hanmer	1270	59.8	+ 0.1	84.0	36.0	4.21	11	+ 0.68	1.66	5	214
Christchurch ..	22	60.0	— 1.4	82.8	42.1	2.27	9	+ 0.04	0.97	5	178
Ashburton	323	59.8	— 1.2	86.2	39.8	4.74	12	+ 2.11	1.62	4	153
Timaru	56	58.6	— 2.0	76.2	41.1	4.46	14	+ 2.09	1.23	1	147
Alexandra	520	60.4	— 1.3	84.1	35.9	2.40	10	+ 0.56	1.03	4	166
Taieri	80	56.4	— 0.6	80.2	34.6	5.67	17	+ 3.29	1.68	29	129
Invercargill airfield ..	0	55.0	— 1.2	76.0	36.7	2.10	16	— 1.63	0.74	1	155
Chatham Islands ..	140	56.6	— 0.7	71.2	40.2	2.75	11	— 0.03	1.01	18	

Use for Old Railway Wagons

SEVERAL steel railway wagon trays of the LA type were being used on the airstrip on a farm visited recently to hold bulk superphosphate, which was covered by tarpaulin. On another property the undercarriages of wooden-floored wagons were serving a further useful life as farm bridges. This type of wagon undercarriage has heavy steel girders on the outside and two thick central girders of hardwood. They have been sold by the Railways Department at about £10 each.

—*D. M. E. MERRY,*

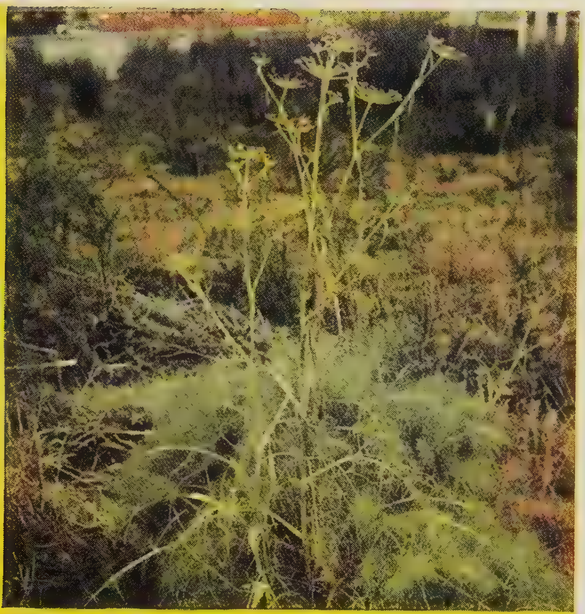
Instructor in Agriculture,
Department of Agriculture,
Pukekohe

WEED IDENTIFICATION

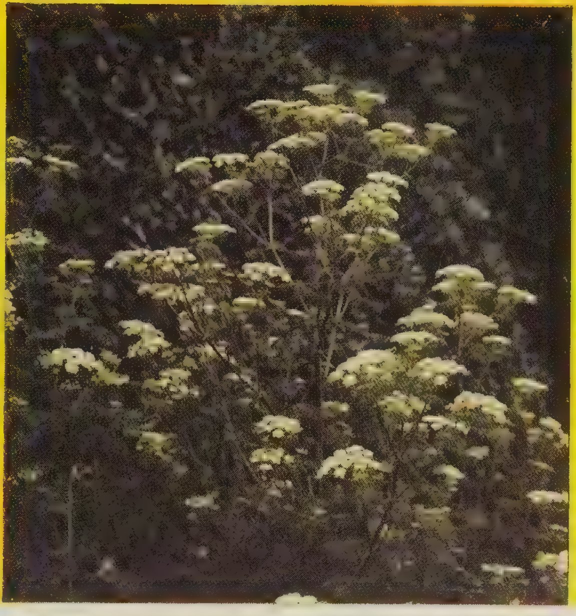
By D. I. GLUE, Instructor in Agriculture, and L. J. MATTHEWS, Weeds Research Officer, both of the Department of Agriculture, Wellington

This is the second of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.

FENNEL



HEMLOCK



TWO weeds that are frequently confused are hemlock (*Conium maculatum*) and fennel (*Foeniculum vulgare*). This confusion can have serious consequences because, though fennel is harmless, hemlock contains a number of extremely poisonous alkaloids and has been known to cause deaths among all classes of stock, though there is some evidence that non-ruminants are more susceptible to hemlock poisoning than ruminants. Poisonings are also recorded in human beings, more particularly in children, who mistake the leaves for parsley or make whistles or pea-shooters from the stems.

THOUGH both hemlock and fennel belong to the *Umbelliferae* family, which includes carrots and parsnips, and are erect and tall growing with the seeds arranged in the characteristic flat-topped clusters known as umbels, they differ greatly in appearance. Hemlock has a musky smell, leaves like parsley, small white flowers, and purple blotches on the stems, which are hollow right up to the top of the plant. Fennel has a rather sickly smell something like that of aniseed, needle-like leaves, small yellow flowers, and unblotched stems, the topmost ones completely filled with white, spongy pith.

Both fennel and hemlock are palatable to stock, particularly in the young stages, and are usually confined to waste places, such as roadsides or along railway lines. It is rare to find them growing in grazed pastures, and apparently by grazing young hemlock plants as they appear stock can keep the amount in the sward at such a low level that no toxic effects are experienced. If stock gain access to substantial amounts of hemlock that have previously been shut away from grazing, there can be danger of poisoning.

Mature hemlock is not very palatable to stock, but its palatability is increased by spraying it with hormone weedkillers. Cattle have been observed to graze out all the sprayed portions of a hemlock trial and leave the unsprayed portions. In this case stock poisoning could occur as an indirect result of the use of hormone weedkillers.

Neither hemlock nor fennel is easily killed with the hormone type weedkillers except as young plants. Young plants can be killed with the esters of 2,4-D and 2,4,5-T at rates of up to 2lb. acid equivalent per acre. Once the plants become old and semi-woody control with 2,4-D is poor; 2,4,5-T has to be used and regrowths, particularly of fennel, usually occur.

The big disadvantage in spraying weeds in waste areas is that the chemical weedkillers applied control only the existing plants. New plants usually establish, necessitating annual sprayings. Control of all plants that establish does limit the spread of such dangerous species as hemlock into adjoining waste areas.

◆

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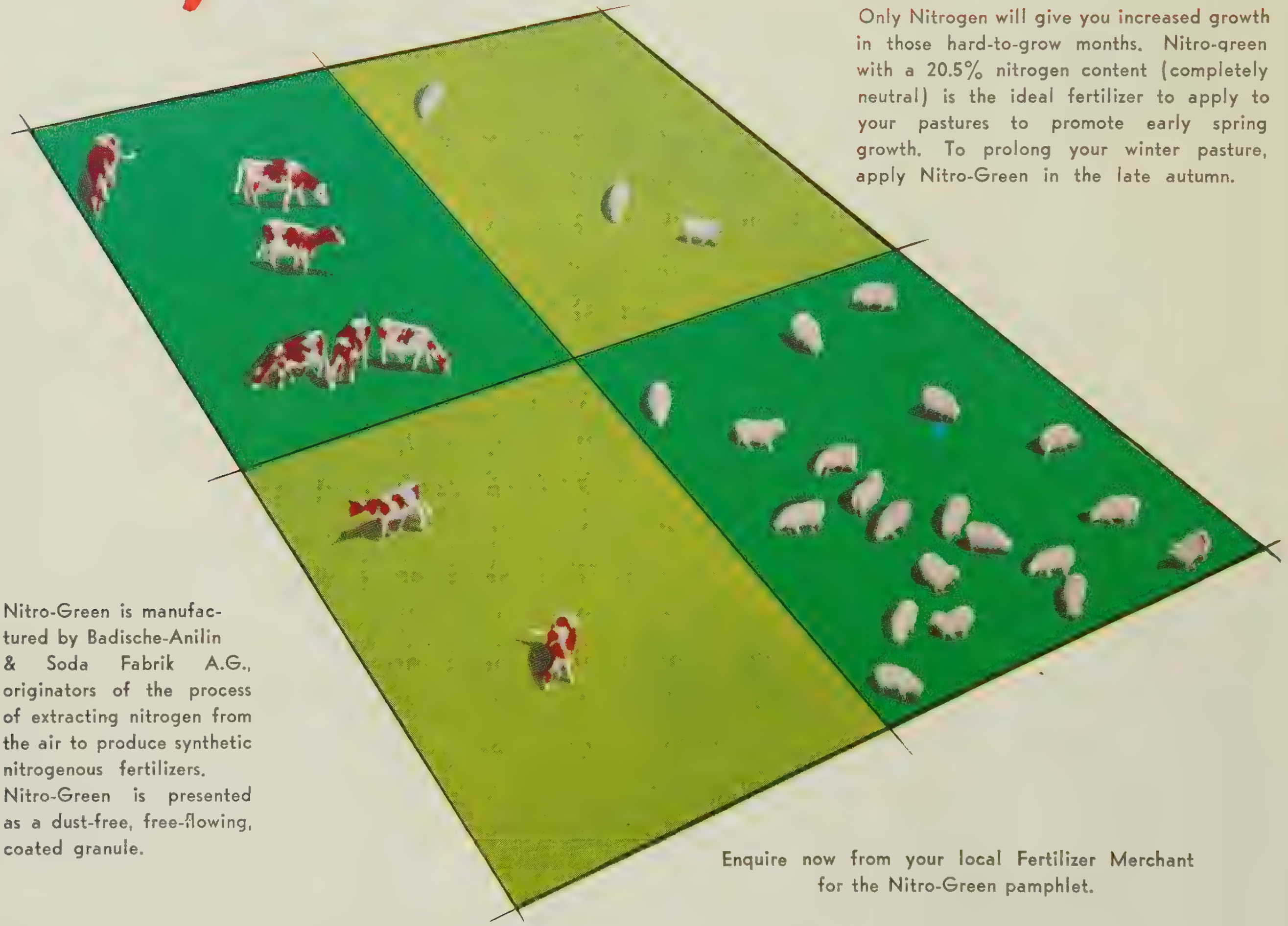

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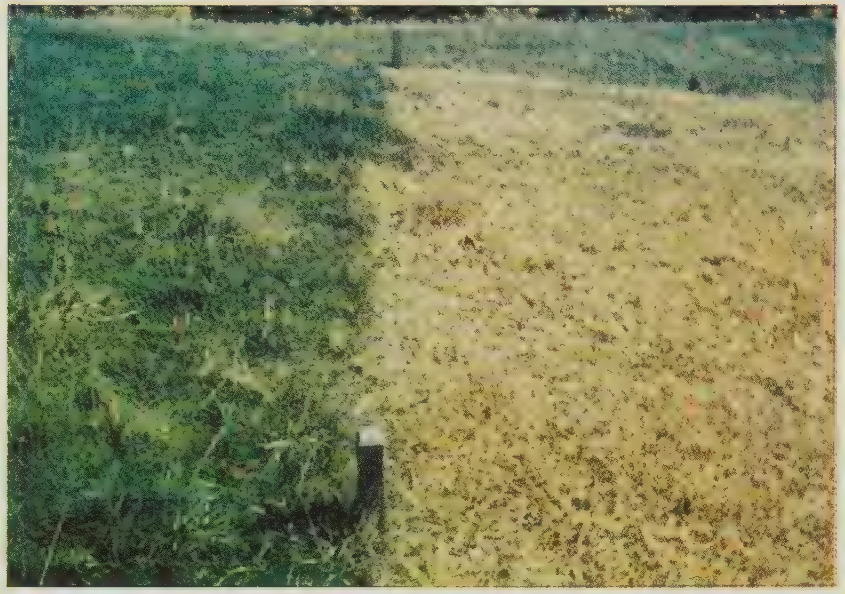
Weedkillers as an Aid to Pasture and Crop Establishment

ONLY about one-third of the farming land in New Zealand can be cultivated by ploughing or giant discing. The importance of a substitute for cultivation that will allow new grass to be established on land too steep for cultivation is only too apparent. In this article by L. W. Blackmore, Instructor in Agriculture, Dannevirke, and L. J. Matthews, Weeds Research Officer, Wellington, both of the Department of Agriculture, trial work by the Extension Division of the Department in the use of weedkilling chemicals as a substitute for cultivation for pasture and crop establishment is described, some 50-odd trials carried out over the past 5 years being reviewed.



At right is a browntop turf mat resulting from the application of 2½lb. of dalapon per acre. This dead turf is suitable for oversowing or drilling in of crops. The area at left has not been treated.

ONE or two specific weedkilling chemicals are used to destroy the existing vegetation in situ and pasture mixtures or crops are oversown or overdrilled into the undisturbed turf. Though the success of the method depends on many local factors, sufficient experimental work has been done to show that the method has widespread possibilities in New Zealand.

Pasture Establishment

In 1953 A. R. Dingwall showed at Cass, Canterbury, that a better establishment of pasture species was obtained where TCA had been used to reduce the sward competition of a sodbound browntop-creeping fog turf before overdrilling. In 1953-54 J. P. Beggs and W. F. Leonard at the Wrekin near Blenheim showed that a balanced, high-fertility sward could be obtained if nassella tussock was destroyed with TCA before oversowing (1). This work was later substantiated by R. A. Milne in North Canterbury with both TCA and dalapon.

▼ The area in the background shows the results of oversowing into a turf mat which has been destroyed by chemicals. The area in the foreground received the same fertiliser and seed mixture but no weedkiller.

Two years ago a series of experiments utilising weedkillers to aid the oversowing of browntop-dominant swards was initiated by L. W. Blackmore with the assistance of R. G. Warren in Southern Hawke's Bay. A similar series of trials was started at the same period by S. M. Maclean and L. J. Matthews at Takapu Road, Wellington. The results of these experiments have been so spectacular that a large number of trials have since been laid down to determine the effect of local conditions throughout New Zealand. In most of the spraying trials already laid down low-fertility, browntop-dominant swards have been replaced by ryegrass-white clover swards merely by oversowing the treated areas with a pasture mixture. In the control plots that were not sprayed but were oversown with the same pasture mixture the amount of clover in the sward was increased, but little if any of the oversown grasses established.

Trials have emphasised that if the high-fertility species introduced are to be maintained, the correct manurial requirements of the soil must be met and the areas must also be carefully managed. Applications of fertilisers and lime should be as liberal as for normal pasture establishment. Pastures established by chemical means on low-fertility swards are usually slower to establish than those laid down by conventional means. For this reason early management is extremely im-

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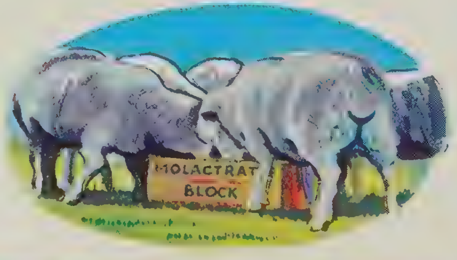

MOLACTRATE
BLOCK

portant. Adequate initial spelling during the establishment stages is vital to success, and subsequently on-and-off grazing for short periods (but never hard grazing) is a very necessary part of the establishment process.

In a number of trials on poor swards the response of the establishing species to applications of nitrogen has been most marked and has been just as noticeable with the clovers as with the grasses. The use of nitrogen in limited amounts under certain conditions may be a necessary part of the establishment cost. The value and economics of this aspect are being closely watched.

Suitable Weedkillers

Except during the dry summer and autumn period browntop can be killed at most times of the year with dalapon at up to 5lb. per acre. Species such as chewings fescue, danthonia, and *Poa trivialis* require higher rates than this and are more effectively killed by the addition of amitrol at up to 2lb. per acre. Amitrol will also kill flatweeds and most other broad-leafed plants. The application of 5lb. of dalapon plus 5lb. of amitrol will remove practically all vegetation in a mixed sward. Dalapon alone merely checks flatweeds, and if broad-leafed weeds are present, it is desirable to include amitrol; otherwise, once the competitive effect of the grasses is removed the weeds begin to grow again and can offer serious competition to the establishing species. Moss can be controlled by PCP at about 4lb. per acre. The sodium salt of PCP in the emulsifiable form should not be added to dalapon, but in the capsule form is quite suitable for this purpose. In trials where amitrol has been used in addition to dalapon comparatively good kills of moss have been obtained.

Length of Sward?

What length the sward should be at time of spraying will depend on a number of factors and particularly on the nature of the covering and how soon after spraying oversowing is done. Under good-rainfall conditions where oversowing is carried out soon after spraying, as with browntop-dominant swards, the sward should be about 1in. to 2in. high. Pasture this long will afford ample protection for the establishing seedlings and will not cause undue smothering. In fact it is probable that pastures should be cleaned up with sheep and cattle in advance of spraying and be allowed to produce a short, even cover at the required time. In a trial in Southern Hawke's Bay slug damage to establishing seedlings and especially the clovers was excessive where growth was 3in. to 4in. high. There was, however, a marked reduction in slug damage where the dead grass litter was opened up with harrows to let the light in. On the other hand poor results have been obtained where oversowing has been attempted on bare ground. Some protective litter at the time of oversowing is essential.

Burning and oversowing have proved unsatisfactory for controlling giant sedge (*Carex longifolia*), which invades poor pastures.

In areas of low rainfall it could well be that pastures of 3in. to 4in. may be necessary to afford adequate protection against the seedlings dying out. However, much will depend on the time of sowing, exposure to winds, and the length of time between spraying and oversowing.

Under special circumstances where nassella tussock has been sprayed up to 6in. of dead litter has proved suitable for oversowing. The value of dead litter was also shown in trials in the Rakaia Gorge by R. L. Bennetts and W. R. Lobb. There is a progressive settling down and disintegration

Giant sedge which has been killed with dalapon at 20lb. and amitrol at 10lb. per acre. The treated area was burnt, oversown, and topdressed and a ryegrass-white clover sward was obtained. This sward should prove dense enough to prevent further weed infestation through seeding.

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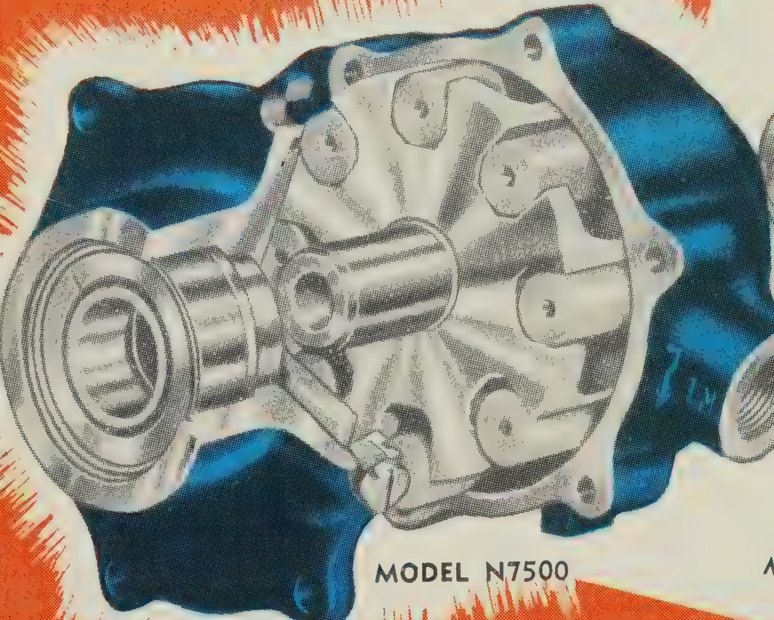

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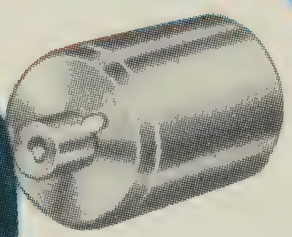

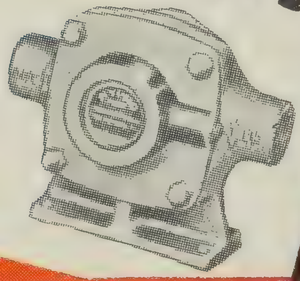

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of the surface litter with continued exposure to the weather.

Best Time to Spray and Oversow

Much work yet remains to be done on determining the best time to spray and oversow, which is an important aspect. From the limited number of trials already carried out, however, it is quite clear that the most suitable time to spray and oversow will vary considerably with locality. Climatic conditions, soil fertility, aspect, and the nature of the covering are the main factors involved.

In North Island trials satisfactory results have been obtained from both autumn and spring establishment. The best kill of grasses, however, has been obtained by spraying during autumn and early winter. If the weedkillers are applied to autumn flush pastures, oversowing can be done 10 to 14 days later and in some cases at the time of spraying without unduly affecting germination, as was shown by the Southern Hawke's Bay and Wellington trials. However, where dalapon and amitrol were used, sowing immediately after spraying seriously affected the strike of clover and only slightly affected the ryegrass if rain followed the spray application or if rates of amitrol were over 2lb. per acre. Good kills of grasses have been obtained from May to June sprayings, but oversowing should probably be delayed until the following spring.

In hill country aspect can be a very important factor in determining success with autumn sowings. In a trial in Southern Hawke's Bay on steep, poor, uncultivable hill country, involving both a northerly and a southerly face, oversowing was done on 15 April. Strike and establishment on the northerly face were outstandingly successful, but on the steepest portions of the southerly face oversowing was a failure.

Spraying deteriorated pastures under dry autumn conditions when growth is at a standstill results in a poor kill of grasses, and volunteer seedling growth that comes away with the autumn rains can seriously threaten establishment of the sown species. On the other hand if spraying is done after the autumn rains when the volunteer seedlings have struck, these perish with the rest of the pasture. Though conditions for the establishment of the sown species are excellent in spring, it has been found that the grass kill is more variable at this time of the year.

In the South Island early autumn and late winter sowings have shown most promise in the limited number of trials to date.

Rate of Seeding Required

Where the existing sward is destroyed normal pasture mixture rates should be sown.

Turnips grown in a trial without cultivation in Southern Hawke's Bay. The turf was destroyed with chemicals and the turnips were then drilled into the dead turf. The crop established weed free.

However, where a deteriorated sward has been sprayed and the low-producing species only have been eliminated a light rate of seeding would be justified. In a trial where browntop was removed from a ryegrass-white clover pasture a seeding rate of 15lb. per acre was quite satisfactory. In trials in the Wellington area there was no advantage in establishing clovers first and then introducing the grasses later.

Comparison with Cultivation

The method of using chemicals to destroy vegetation before oversowing has compared favourably with cultivation and has met the two essential requirements of cultivation, that of preparing a suitable seed-bed and of reducing competition between plants. With cultivation, on the other hand, the reduction of this competition is not so absolute because weeds have the same chance of striking as the sown pasture species. With the chemical method, because the surface is undisturbed, weed seeds have a much smaller chance of striking. Even the burning off of chemically treated pasture litter can induce weed seeds to strike.

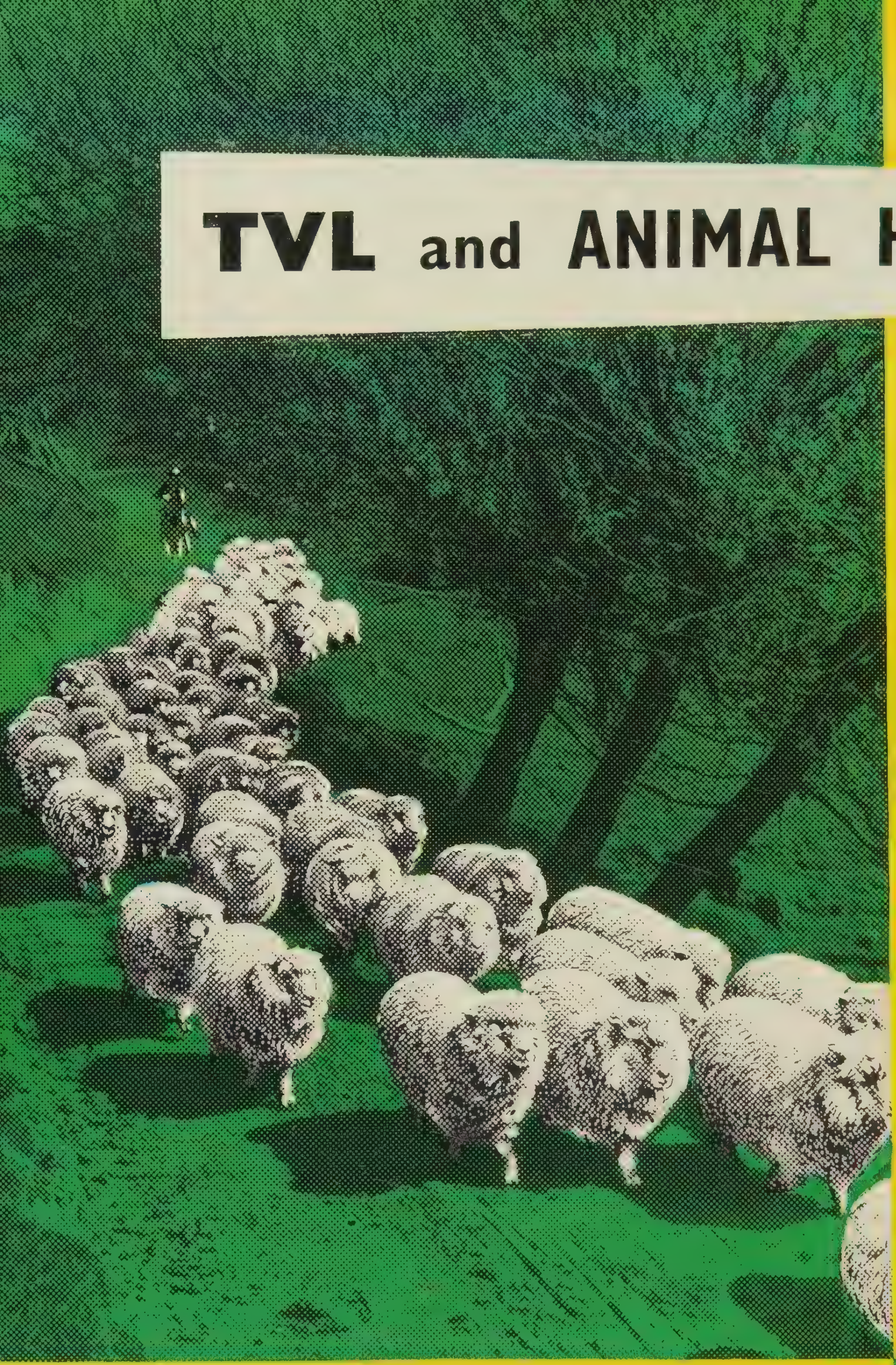
The chemical method of establishing pastures is likely to be advantageous on country that is difficult to consolidate; is subject to blowing if disturbed; is likely to erode badly; cannot be satisfactorily cultivated on account of boulders or hidden timber; and particularly on land that is too steep to cultivate. The weedkiller, seed, and fertiliser can all be applied from the air as was done in the control of nassella tussock in Marlborough. Based on present contract prices pasture establishment on hill country by chemicals would cost considerably less than by cultivation.

Comparison with Overdrilling

Work in the Southern Hawke's Bay district indicates that as an aid to oversowing pastures both overdrilling and the use of chemicals have their places.

Where sward competition is sufficiently low to permit the successful introduction of pasture species into an existing sward by overdrilling this method may be used, because it is a cheap once-over operation, and initial establishment is usually quick and even because the seed is placed directly into the soil with the fertiliser close to it. For a full account of the place of overdrilling, readers are referred to the articles on this subject appearing in the January and February issues of the "Journal".

There are, however, definite limits to successful overdrilling which must be recognised. For instance, on tight swards, especially under moist, fertile conditions, results from the overdrilling of grasses are very uncertain. Under similar conditions, however, the use of chemicals in an amount necessary to weaken the existing species



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PERCENTAGE OF SPECIES IN MOWN HERBAGE

	Perennial ryegrass	*Poa* spp.	Browntop	Yorkshire fog	Other grasses	White clover	Other clovers	Other species
Control—no improvement ..	38	9	15	13	7	13	—	5
Fertiliser plus oversowing ..	36	11	13	7	8	21	trace	4
Chemically treated plus oversowing and fertiliser ..	78	7	3	4	2	2	2	2

can materially assist the establishment of introduced species by both overdrilling and oversowing. Where chemicals are used, however, the case for overdrilling weakens. However, the possibility of spraying directly in the paths of the overdrilling furrow openers could be well worth while because of the very small amount of spray per acre that would be required. Work is to be continued on this aspect.

Because of the mechanical limitations of overdrilling machines and the more specific requirements of terrain and pasture preparation required the chemical approach to oversowing has a wider general application.

Comparison with Normal Oversowing

Oversowing and topdressing are the normal methods of improving hill country swards. Though reasonably good clover establishment is usually obtained by such means, attempts to establish grasses are rarely successful. Clover establishment can give a marked improvement in carrying capacity, but the development of a high-producing sward is usually slow and costly.

The chemical method has allowed the direct introduction of the higher-fertility-demanding grasses into swards by oversowing and also a more rapid establishment of the clovers. In trials in Southern Hawke's Bay and Wellington areas broadcasting into untreated controls gave poor results compared with the chemical method. In all cases a good fertiliser response was recorded, but the percentage of desirable species increased only slightly. In a mowing trial at Marton established on a deteriorated browntop sward sown in May 1957 the herbage dissection data shown in the table above was obtained from a cut taken on 31 October.

This trial indicates that the original amount of ryegrass in the sward has not been increased by ordinary oversowing, but that the legumes responded well to the fertiliser application. The ryegrass in the chemically treated plots has increased, but because of the late sowing the establishing clover was too small to be picked up by the mower. Under suitable management the chemically treated plots would become dominant ryegrass-white clover swards. Applied fertilisers are probably better utilised in the areas chemically treated before oversowing, particularly on high-phosphate-fixing soils.

Slug and Insect Damage

Oversown species which are establishing in a chemically treated turf may be attacked by slugs or insects. The reason for this is that the feed supply has been suddenly spoiled and the pests naturally direct their attention to the establishing seedlings. Further trials are being conducted to find suitable chemicals for the control of both pests. It is hoped that these materials may be added to the dalapon or dalapon-amitrol mixtures.

Crop Establishment

Only limited success has so far been obtained by overdrilling crops into chemically treated turf and this work must still be regarded as being in the purely investigative stages. The greatest problem facing this work is to get a satisfactory kill of the sward species with chemicals at rates which are economic. The main difficulty is that often such species as ryegrass and cocksfoot are involved. These grasses require considerably higher rates of chemicals for an effective kill than does browntop. The sward may need to be sprayed at a time of the year when the results from chemicals have proved to be very variable.

However, it is hoped that the chemical approach will be the ultimate answer to crop establishment on weedy land. In a trial laid down in November 1956 in Southern Hawke's Bay on fat-hen infested country it is of considerable significance that in the restricted areas where a turnip crop did establish not a single fat-hen plant was found. The other feature was that at least nine-tenths of the bulbs were out of the ground.

Summary

The results of the Department's work show that in New Zealand chemical removal of inter-plant competition to enable pastures and crops to be oversown and overdrilled into existing turf has widespread possibilities. The chemical method requires a sound knowledge of the effects of weedkillers before it can be successfully used under local conditions. Farmers interested in the method should first obtain sound advice and then initially treat small areas until they have become familiar with the method. Areas improved by the chemical method should be treated in the same way as pasture renewed by conventional means. The correct fertiliser and management practices must be applied if the chemical method is to succeed.

The outstanding feature of the use of chemicals on pastures is the possibility that the hill country farmer may be provided with the equivalent of the plough and other cultivation equipment for his work on pasture improvement.

Reference

1. L. J. Matthews, "New Zealand Journal of Agriculture", vol. 95, p. 441, 1957.

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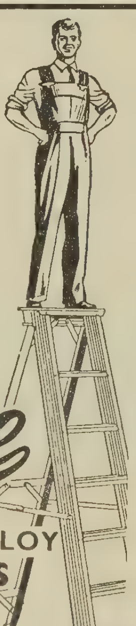

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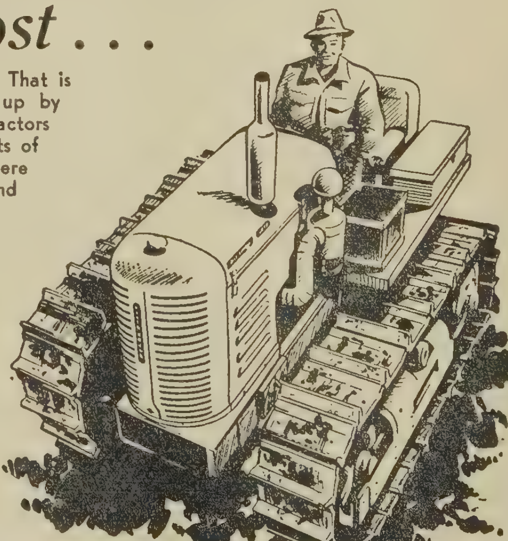


Close-of-season Work in the Domestic Apiary

Seasonal Notes for the Domestic Beekeeper

AT the close of the season, after all honey supers have been taken off the hives and the combs extracted, the domestic beekeeper will find he still has a few jobs that will require attention, some immediately and some that can be left until later. In this article A. W. Bennett, Apiary Instructor, Department of Agriculture, Hamilton, describes how to deal with some of these jobs.

THE first job for any beekeeper at the end of the season is, of course, the preparation of his bees for the coming winter. He should inspect the brood for any sign of disease and make sure a good queen is present. If the queen is old or there are signs of her failing, such as patchy brood or much drone brood, he must decide at once whether he is going to buy a young queen and introduce her this season; whether he will kill the queen and unite the hive to another, say, with a good young queen but weak in number of bees, possibly through being obtained from a late second swarm or a nuclei; or whether he will requeen the hive in early spring.

If the colony is in normal condition, the brood and queen may be placed in the bottom box for winter with a full super of honey and pollen above. While this work is being done any damaged box should, of course, be changed for a good one. The floor board should be cleaned and placed on, say, four bricks, to keep it off the ground and allow plenty of air to circulate under the floor, and a leaky roof should be replaced with a sound one. Beekeepers who winter their bees in the above condition can expect their hives to be in good order the following spring and should suffer no winter losses.

Storage of Combs against Wax Moth

After the combs have been extracted and dried they will require storing for the winter and protection against wax moth, mice, and rats. The best place for the domestic beekeeper to store his combs is in a dry, open, airy shed or lean-to.

After checking over his combs and culling out those fit only for melting down he should space them eight to a box. (This open spacing will help to keep wax moth down.) He should then place two lengths of 3in. x 2in. timber on the floor of the shed, spaced the width of a box apart, and on this he should place the boxes, with an excluder under the bottom one. A 2in. air space should be arranged around each pile of boxes.

On top of each pile he should again put an excluder and on top of the excluder and in the middle a piece of paper about 6in. square. On this piece of paper is placed one level dessert-spoonful of PDB (paradichlorobenzene) crystals for each pile of boxes eight high. Over this is placed an empty super and then a roof. Room should be left along the side of the stack so that 2 repeat doses of PDB can be put on each pile again at intervals of 2 to 3 weeks and again as the warmer spring weather approaches. An air space of about 12in. between the roof of the pile and the roof of the shed should also be left.

PDB is a white crystal and when exposed gives off a gas that is heavier than air. This penetrates down through the boxes of combs and kills the wax moth larvae but not the eggs, so the second and third doses are essential. In warmer parts of the country where the wax moth starts to move about in early spring it is as well to repeat the dose as a safety measure.

The excluders are put on top and at bottom of each pile of boxes to exclude rats and mice, and are very effective unless these pests gnaw their way through the sides of the box.

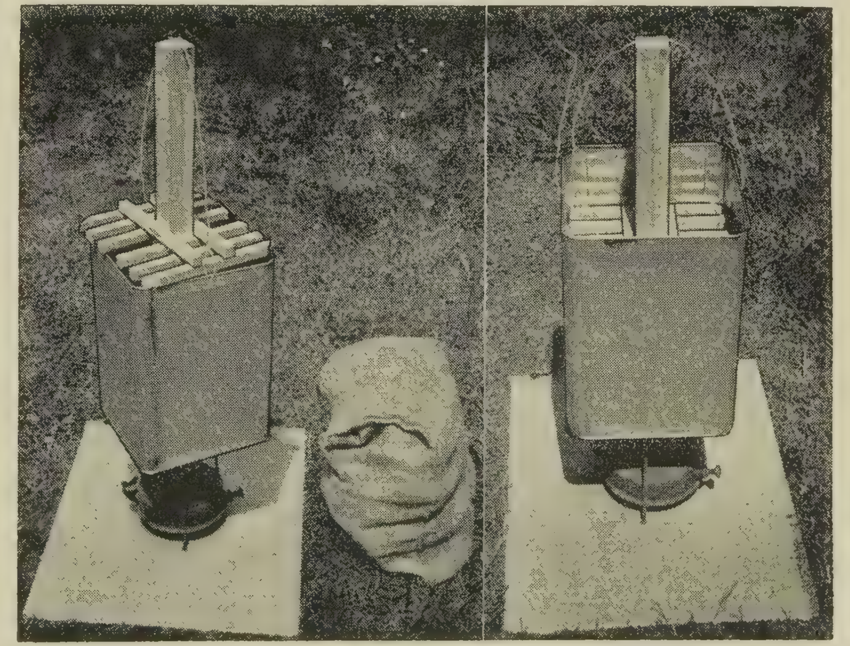
The beekeeper with, say, only half a dozen boxes to carry over the winter may if he wishes wrap each box completely in 3 or 4 thicknesses of newspaper and seal the joints with an adhesive tape, putting about 6 moth balls (naphthalene) inside, 1 in each corner and an extra 2 toward the centre of the box. If left undisturbed, these boxes should be quite free of any wax moth when required.

If these methods are followed, it is advisable to air the combs thoroughly in spring before use on the hives.

Old or Damaged Combs

Old or damaged combs and pieces of burr comb should not be left lying about, as they are a sure place for the wax moth to deposit its eggs. They should be rendered down into cakes of wax at an early opportunity. To do this the beekeeper will need a 60lb. tin with the top end cut out, a good strong muslin bag, and a frame or plunger made to fit loosely inside the tin as illustrated.

After the old combs have been cut out of the frames they can be broken up and put in the bag and the neck of the bag tied with a piece of string. This bag of comb is placed in the tin with the neck at the bottom. (The bag of old comb can nearly fill the tin if desired.) The plunger is put in place and secured down tightly by a piece of wire fitted to the tin to form a handle, the handle part wedging tightly over the upright of the plunger. The container is filled to about 2in. below the top with water and allowed



Left—Unit for rendering down old or damaged combs. It comprises stove, tin, plunger, and bag containing old combs. Right—The plunger of the unit pressed down and secured by the thin wire handle.

to boil. As the water gets hot the plunger is pushed down until all the wax has come to the top, above the plunger, the residue remaining below in the bag. While the wax is still liquid it should be poured off into a suitable container and allowed to cool. The bag can be emptied and if necessary refilled and the process repeated.

Though this method does not recover all the wax, it does give the beekeeper a good return for his labour and saves storing old and damaged combs; it also allows him a chance to clean the frames and refit them with foundation during the winter.

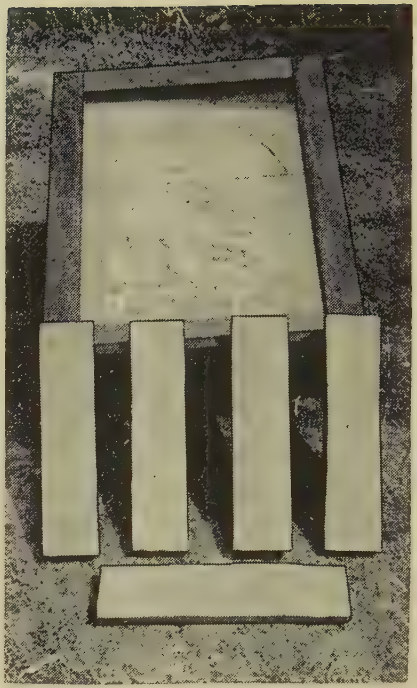
By far the best method for the domestic beekeeper to render down pieces of burr comb or combs that are damaged is to use a solar wax extractor, which is shown below. As he finds these bad and damaged combs during summer he can put them into the extractor and allow the hot sun to melt them for him. In this way he will save himself much work and get a far brighter cake of wax.

Painting and Repairing Supers

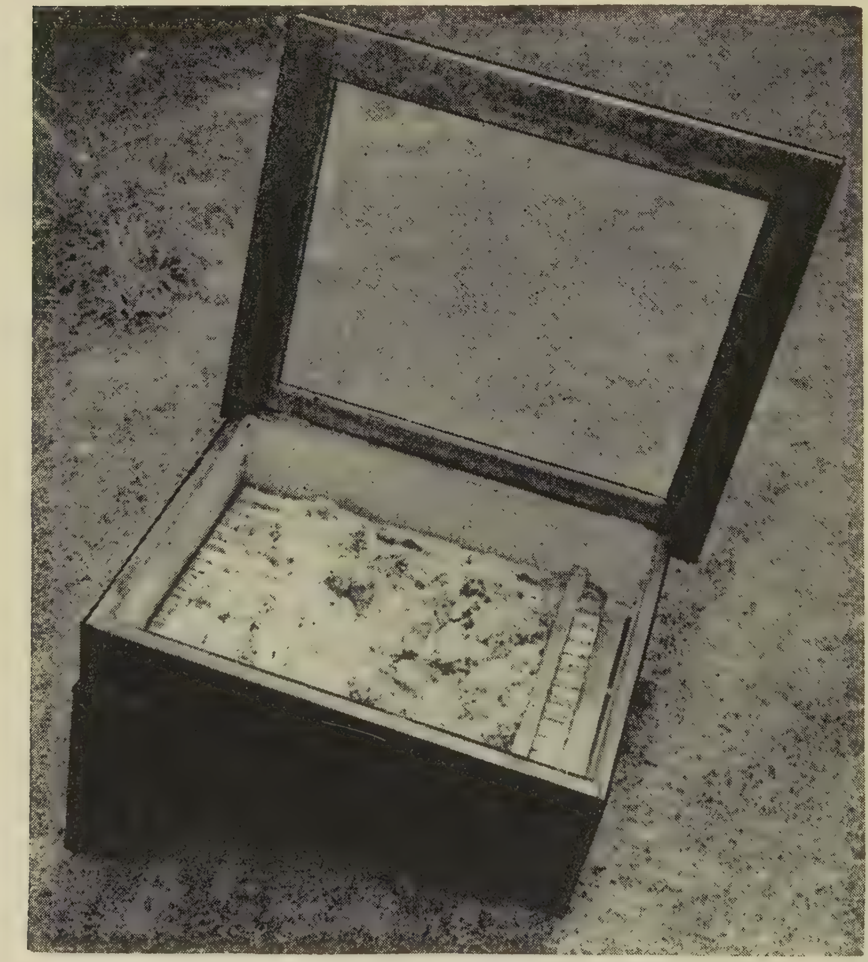
Honey supers and other hive parts, like all other woodwork which is out in the weather, will require painting and repairing occasionally. When the supers are being painted it is a good idea to nail on the workshop bench two battens about 18in. long, spaced about 13in. apart over all and projecting over the edge of the bench about 9in. On these battens is hung the super, which should be rubbed down with coarse sandpaper or a wire brush. The super can quite easily be turned to the next side if one hand is put inside it to take its weight. Brush the dust off each side as it is rubbed down. Next paint the four sides, and, most essential of all, both edges. For painting the supers a roller is much faster than a brush and is much easier on the hands. When they are finished the boxes can be stood criss-cross on each other in piles to dry.

Supers often get damaged during use, mostly along the top and bottom edges of the ends of the box. This is usually caused by the insertion of the hive tool when the boxes are prised apart; water eventually gets inside the box and rests on the rabbet cut to hold the frames, causing the box to deteriorate there, though the remainder of the box is sound. When repairing supers the beekeeper should remember that repaired boxes will have to stand up to being prised apart again with hive tools. A piece of timber large enough to stand up to this handling, say, about 2in. wide, should therefore be inserted. This width will also be wide enough to allow the timber to be fixed firmly.

The first step in repairing a damaged super is to remove the part to be replaced. This is done by punching the nails of this part well down through the wood and into the side with a carpenter's punch or a strong nail. If a nail-drawing tool is available, the nails should be withdrawn. The nails through the sides and into the ends in any case should be withdrawn and the saw can then be run through to cut off the damaged part. The piece of timber used to replace the cut-out portion should be well painted where it joins the box and nailed on while the paint is still wet. When this has been fixed the whole box should be repainted. If old damaged supers are repaired in this way, they will again give years of service.



Solar wax extractor with the glass front closed. In front are cakes of beeswax which have been produced in the extractor.



A solar wax extractor with the glass front raised.

Work in the Home Garden in April

[*Sparrow*

In most soils it is preferable to dig potatoes when the crop is mature rather than leave them in the ground, where they are liable to damage from pests or disease.

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

TYPICALLY, the rich colouring that the leaves of many deciduous trees and shrubs develop late in April heralds the end of another growing season, but more significant to many experienced home vegetable gardeners is the decline in both air and soil temperatures. Temperature is one of the major factors influencing plant growth, and consequently the number of vegetables that can be sown, or even planted, in most districts in April is very limited.

FEW kinds of vegetables should be sown in the open during April, even in favourable districts, though hardy, quick-maturing vegetables like spinach and turnips can be sown in most favourably situated, well-drained soils that are not too cold. Cabbages, cauliflowers, silver beet, and lettuce can be set out in most districts, but seed should be sown only if the soil is well drained and fertile and the aspect and situation are favourable.

As frost can be expected in many districts in April, the harvesting and storing of crops such as onions, cucumbers, pumpkins, marrows, and squash should be completed before low-temperature or frost damage occurs. Low temperatures should be avoided for kumaras, particularly if they are to be stored, and frost is liable to damage plants such as pumpkins, marrows, squash, and onions. Light frost is unlikely to affect the keeping quality, but heavy frost will do so, though the damage may not be apparent immediately.

The pods of peas and dwarf and runner beans should be picked regularly before they are fully mature to encourage the plants to continue bearing. If more beans are available than are needed immediately, they can be preserved by salting, though with the increase in the number of household refrigerators, this method is not now used extensively. However, there are several good recipes for the preservation of beans by salting and, if preserving is done correctly, the home gardener should have available for many months a supply of beans that are not much inferior in flavour to freshly picked ones.

Leeks should be earthed up as they develop, if long blanched stems are wanted. Celery, too, should be blanched by being earthed up, by the use of suitable reinforced paper or

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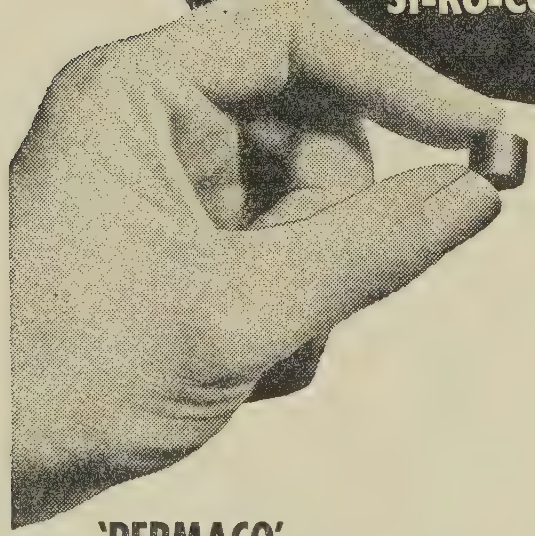

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[*Sparrow*

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boards along the sides of the beds, or by wrapping the stems of individual plants in paper.

Ground should be cleared and dug over as each crop is finished and refuse put on the compost heap or dug in. If the land is not wanted for several months, a green crop should be sown; lupins or mustard can be sown where ground temperatures are high enough to ensure good growth, but where ground temperatures are lower, oats, barley, or ryecorn are usually better.

Though generally the season of growth for tender and half-hardy crops such as marrows, pumpkins, cucumbers, and tomatoes is nearing its end, steady growth can be expected from hardy plants such as those of the cabbage family, leeks, silver beet, and spinach.

In some districts a sowing of peas to overwinter can be made toward the end of the month, but soil conditions must be favourable for success with overwintering peas. In some southern districts it is customary to make an early sowing of broad beans toward the end of the month, but early sowing is not necessarily an advantage.

Where winters are not too severe a sowing of carrots can be made preferably early in the month, as advised in last month's "Journal". Onions, too, can be sown, as advised in last month's "Journal", where winters are not too severe.

Potatoes should be dug when mature or as soon after as is convenient. If they are left in the ground, they are liable to injury from weather, insect pests, or disease.

Asparagus

It is not advisable to cut the top growth of asparagus until the foliage begins to turn yellow through the onset of cold autumn weather. While the tops are green the plants are manufacturing plant food and building up crowns from which strong spear growth can be cut next spring. If, however, cutting is deferred too long, the seed ripens and falls and the young plants which come up the following season are often unnoticed and become established to the detriment of the bed.

Fern growth can be cut with hedge shears which have notched blades, with secateurs, or with a sharp knife. The bed should be weeded afterward if necessary. The top growth is sometimes left to dry and then is burnt on the bed, but it is preferable to put it on the compost heap.

Celery

In most districts celery will have reached its maximum development by now. If it has not yet been blanched, that work should be done as advised in last month's home garden notes. In districts where a favourable growth period can still be expected self-blanching celery can usually be improved after the blanching material has been put in position by watering with sulphate of ammonia or nitrate of soda at about 1oz. to 2 gallons of water. This usually stimulates growth, causing elongation of the heart and leaf stems and improving the texture.

Regular spraying with bordeaux mixture (4oz. of bluestone and 5oz. of hydrated lime to 4 gallons of water) or, preferably, a suitable Government-certified fungicide such as captan, nabam, zineb, or copper oxychloride should not be neglected, as celery leaf spot disease spreads rapidly in the moist conditions which usually prevail in late autumn.

Rhubarb

Rhubarb beds should be kept free from weeds, which make rapid growth in the rich soil needed for rhubarb. Rhubarb for harvesting in autumn and early winter usually benefits from a topdressing of a complete fertiliser, which can be made up of 3 parts of sulphate of ammonia, 3 parts of superphosphate, and 1 part of sulphate or muriate of potash, all by weight, worked in at 3oz. to 4oz. to the square yard.

Spring Cabbage

If early spring cabbage is desired, sturdy, well-grown plants with good root systems can be set out in most districts in April, preferably toward the end of the month, though cabbage for spring use can be set out from early autumn until mid-winter, or even late winter, depending on climate and variety. If large plants are set out too early, they may make soft growth and be severely checked or even forced into premature seed development by winter weather.

If plants are set out very late, they may be late in maturing. Cabbages planted very late in autumn may not mature earlier where winters are severe and may be less satisfactory than plants set out in late winter or early spring.

Manures

The soil for spring cabbage should be rich in organic matter. In most home garden soils a dressing of organic manure such as farmyard manure, stable manure, or compost or a moderate dressing of fowl manure is likely

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to give best results. If the soil has not been limed recently and there is a risk of its being acid, a dressing of 3oz. to 4oz. of carbonate of lime per square yard is advisable. Heavier dressings may be necessary on some soils in high-rainfall districts.

Lime is best applied some time before planting. Distribution and incorporation by forking over should be as even as possible.

Though the manurial needs of cabbages are heavy, care should be taken to distribute fertilisers or manures evenly, as young plants may be checked if the roots come in contact with too heavy concentration of manure, particularly when low temperatures limit growth. Where organic manures are not available a green crop should be dug in. Except where the soil is very rich the organic manure or green crop should be supplemented by a complete fertiliser at about 2oz. to 5oz. per square yard.

In addition side dressings of nitrogenous manures such as nitrate of soda or sulphate of ammonia are often advisable, particularly where organic matter applied to the soil is strawy rather than sappy and well rotted and when quick, forced growth is required (as when temperatures rise in early spring).

Varieties

There are many good varieties of pointed or spring-type cabbage, but Flower of Spring is probably the best for the greatest range of conditions. Triumph has also given good results in many districts.

Spring Cauliflowers

Cauliflowers and cabbages have similar needs, but cauliflowers are more sensitive to adverse conditions. If checked, they are likely to button (form only miniature heads). Frost damages the curds and may permit the entry of soft-rot organisms. Cauliflowers should therefore be planted out only in districts or situations where winters are not very severe. In unfavourable situations planting is often deferred until late July, August, or even September.

Hardy varieties of cauliflower suitable for planting now include All Seasons (All Year Round), Walcheren, and Early London. Plants are obtainable from most seedsmen.

Diseases of Cabbage Family

Some diseases of members of the cabbage (brassica) family, such as cabbage, cauliflower, broccoli, Brussels sprouts, and kale, are:—

Club Root

Club root is a fungous disease which is more common on acid soils and, once introduced, may be carried over in the soil for several years. The fungus enters the root system of the plants, causing swellings or abnormal growth; plants are checked and may wilt badly in warm weather because the swollen root system interferes with the moisture and food supply.

[*Green and Hahn*

Strains of rhubarb grown for winter pulling are rarely as large as this and on the poorer soils the plants usually benefit from a topdressing of fertiliser.

Because club root is usually more prevalent on acid soils, the application of lime to the soil some time before planting out brassicas is usually helpful. If lime is to be effective in the control of club root, it must be well mixed with the soil particles. It is usually necessary to rely on rain to bring about the final intimate mixing of the lime particles with the soil, even though mixing may be achieved to a great extent by cultivation.

The amount of lime required depends on the texture and acidity of the soil, but a general recommendation where club root has been severe is about 1lb. of carbonate of lime per square yard the first year, followed by annual applications of ½lb. per square yard. Drainage should be attended to and acid fertilisers, such as sulphate of ammonia, should not be used.

Plants badly affected by club root should be removed and burnt. If plants have been affected in the seedbed, any with knobby roots should not be planted or, if a shortage of plants makes it necessary to set out plants from an infected bed, seedlings chosen for planting should have affected parts of their roots cut out first.

Alternatively, plants can be grown successfully on affected land if the holes in which the plants are to be set are first treated with mercuric chloride. Other preparations such as

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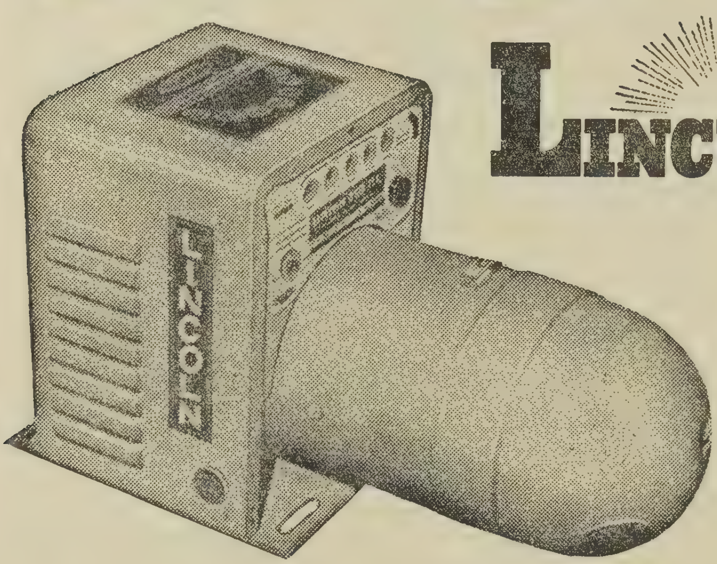

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[*Sparrow*

Lime can be applied at any time of the year, but late autumn is especially suitable, because ground is usually being dug over then and winter rains help to wash it in.

PCNB have given some protection in recent trials, and it should soon be possible to make sound recommendations about the use of fungicides which are less poisonous to warm-blooded animals than is mercuric chloride. Some home gardeners claim that a measure of control can be obtained by using captan at 1 tablespoon to 1½ gallons of water and applying the mixture at ½ pint per planting hole.

Downy Mildew

Downy mildew is a common fungous disease of brassica crops. It is especially troublesome on young seedlings. Infection appears first on the lower side of the seed leaves as a white, mealy or furry growth. Badly affected seedlings, or even large plants, may be stunted and eventually killed.

Treatment consists of avoiding overcrowding in the seedling bed, as aeration is important in the control of the fungus, and spraying with a suitable copper spray. The use of a good sticker with the spray is recommended.

Kumaras

As kumaras gain rapidly in total yield and as table quality of mature tubers is better than that of immature ones, home gardeners usually leave the main crop in the ground as long as possible to obtain greater production. Where tubers are to be stored, however, digging should be completed before there is risk of low-temperature injury.

Even when tubers are not to be stored it is advisable to remove them promptly if an unusually early frost kills the tops, as rots develop in the foliage and sometimes penetrate to the tubers. When kumaras are mature enough for storage the skins should be reasonably firm. They can be tested by cutting. Mature tubers when cut dry rapidly and cleanly on exposure to the air.

Most varieties of kumaras are likely to be injured when the temperature falls to 40 degrees F. (8 degrees above freezing point) and the keeping quality is so seriously affected that long storage is usually impossible. For best results the tubers should not be subjected to temperatures below 50 degrees F.

If tubers are carefully harvested and properly cured and stored, it should be possible to keep them until next season's crop is ready. However, if digging is delayed until after frosts and tubers are left for several days in wet, cold soil, loss during storage may be very high. Even a few days at 40 degrees F. may cause discoloration, and if the tubers are set to grow shoots for cuttings, poor sprouting is likely.

Storage

To ensure that their quality remains at its best from one harvest to another tubers should be handled with care. Badly damaged ones should be rejected and the remainder subjected to a period of fairly high temperature and humidity to cure them and enable wounds to heal. They should then be stored in conditions of scrupulous hygiene at a temperature of not less than 50 degrees F.

Where small quantities are being stored a reasonably warm shed or cellar is usually suitable if the tubers are placed in dry sawdust or dry sand. Wrapping individual tubers in newspaper has been very successful. Deep placement in dry sand will prevent rats from getting to them. Where large quantities are stored a pit or bank similar to that used for big crops of potatoes is occasionally used, though it is not generally recommended. However, a pit may be satisfactory if it

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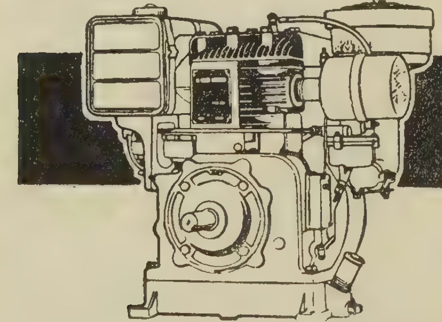

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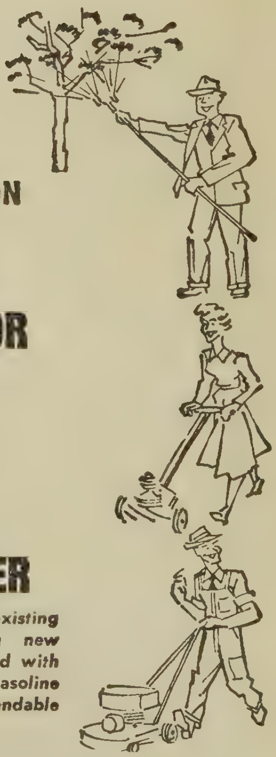

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[Photo News

Silver beet is one of the easiest vegetables to grow, but in poor soils crops for winter supply should be topdressed with a nitrogenous fertiliser or given liquid manure to stimulate them into growth.

is well made and insulated against cold and wet and there is room for a person to move about in it. It should be clean and vermin proof, as rats and mice not only eat the tubers but spread diseases that cause rotting.

Lined storage places, bins, and containers that are used year after year should be sprayed with a fungicide before being used. Copper sulphate (½lb. to about 12 gallons of water) is suitable.

Proper curing is as necessary as care in lifting and handling. In New Zealand curing of a kind is usually done by gathering the tubers into heaps and leaving them for about a week, keeping them covered during rain or at night with their vines or old sacks. Where temperatures are sufficiently high quite fair results are usually obtained from this method. By the time the tubers are ready for storage damaged ones which may have been overlooked have begun to decay and can be rejected. If tubers are to be properly cured in the field, they should be subjected to temperatures of not less than 70 degrees F. and fairly high relative humidity day and night for as long as 3 to 4 weeks or more. Such long curing is not usually practical in New Zealand because of the need to grow the plants for as long as possible. Curing for too long may also result in excessive sprouting.

[Green and Hahn

Because of the likelihood of frosts in April it is advisable in most districts to gather tomatoes that are reasonably mature and store them as described on this page.

It is rarely possible for the home gardener to cure kumaras under ideal conditions. It is difficult even for the commercial grower unless large quantities are grown and stored, as a strict routine must be followed.

Tomatoes

Most districts experience frost in April, and where more than a few degrees of frost are likely it is advisable to gather all tomatoes that are reasonably mature. Well-coloured fruit can be put aside for immediate use or for preserving; the remainder should be stored in conditions that enable ripening without collapse or softening.

Home gardeners often put fruit on a sunny windowsill or expose it under glass to the sun to colour and ripen it, but such treatment is usually advisable only with fruit that is nearly ripe; otherwise the fruit will be soft and rubbery before it ripens.

Sound green fruit that is dry and reasonably mature though not coloured can be packed in boxes and the boxes stacked one on top of another in a shed, or the fruit can be wrapped individually in paper or stacked in a box with material such as clean straw or a double layer of scrim between each layer. A temperature of about 50 to 60 degrees F. is satisfactory.

Mature fruit will ripen fairly well if the tomato plant bearing it is pulled up by the roots and hung up in a shed. Light is not necessary for ripening. Temperature, humidity, and control of atmospheric gases—carbon dioxide is the retarding factor—are all important.

Under ideal conditions higher temperatures than 55 to 60 degrees F. are desirable, though humidity must be closely correlated to it. Higher temperatures without humidity will cause fruit to soften or become rubbery. In humid conditions fruit must be picked over regularly, as rots develop very quickly.

Where a relatively large number of plants are grown and there are more tomatoes than can be consumed immediately, the excess should be preserved. Tomatoes are particularly good as a source of vitamins. Correctly preserved they retain much of their vitamin content and are therefore most valuable for use during winter.

◆

Care of Livestock during April

Contributed by the Animal Research Division

CARE OF EWES

If rams remain with the ewes for more than 4 weeks, they should be raddled on the brisket so that the late-lambing ewes can be drafted off. Once the ewes are in lamb the level of feeding should be lowered to prevent their becoming too fat. If the rate of stocking is increased during autumn, some paddocks can be shut up and pasture allowed to grow for grazing during the 3 weeks before lambing. These measures will greatly assist in reducing "sleepy sickness", which is more prevalent in fat ewes which are inadequately fed just before lambing. Ewes well fed during the month before lambing produce on the average ½lb. more wool per head than those underfed during this period.

DECEMBER-FARROWED PIGS

Litters farrowed in December should be sold as pork. If they are carried on to bacon weights, no milk will be available for the later litters, which will have to be sold cheaply as stores or wintered on expensive concentrates. Available root crops may be fed to sows, but they require supplementing with milk or meat meal.

TUBERCULOSIS IN POULTRY

Tuberculosis not only causes considerable loss in poultry, but it frequently spreads to pigs, with consequent condemnations at the meat works. If this disease is suspected, veterinary aid should be sought to eliminate affected birds.

CARE OF LAMBS

If summer and autumn have been wet, lambs are likely to be suffering from worms. Drenching with phenothiazine 2 or 3 times at monthly intervals will help. This applies particularly to the tail of the flock, which should be drafted off for special attention. Feed, however, is the most important consideration. During autumn lambs do best if grazed on pastures which have been allowed to grow to a height of 4in. to 6in. Hay aftermath and clover are very good. If these are not available, the lambs should be distributed thinly over the dairy paddocks or on hill pastures. They should on no account be concentrated in large numbers on short, rapidly growing pastures, especially if these have previously been grazed by ewes and lambs.

PURCHASE OF HERD SIRE

If a new herd sire will be required this year, now is the time to make inquiries. The New Zealand Dairy Board issues a Sire Survey and Merit Register, which gives the production of the daughters of all dairy sires which have been surveyed. Unfortunately very few progeny-tested sires are available, but the Register should be consulted and wherever possible a bull by a proven sire out of a merit cow should be selected. Bull catalogues are issued annually by the Herd Improvement Association and these, too, should prove of considerable value to dairy farmers who are looking for herd sires. The New Zealand Dairy Board is now developing artificial breeding on a commercial basis and farmers interested in making use of this service should get in touch with the local Herd Improvement Association.

CARE OF CALVES

The best way to prevent calves dying during winter is to treat them properly during autumn. They should never spend more than 2 or 3 days in one paddock, and should be rotated ahead of the cows through the best paddocks available. Good-quality hay should be provided for them daily, especially when the feed is growing fast after autumn rains. Set stocked calves should be drenched with phenothiazine as soon as scouring is noticed.

DRYING OFF DAIRY COWS

A dairy cow requires a reasonable spell between lactations and should be dried off at least 6 weeks before she is due to calve. This should be done even if she is still milking heavily. The drying-off process need not be prolonged; it is quite safe just to stop milking, provided any quarters affected with mastitis are treated with the usual course of 3 tubes of penicillin, the last tube being given after the cow is milked for the last time.

AUTUMN SAVED PASTURE

Early-calving cows are nearly always short of feed during July and August and often during September. In most seasons pasture is not growing fast enough during these months to meet the requirements of milking cows. Crops are expensive to grow and concentrates are even more expensive to buy. It costs nothing, however, to shut up pasture in the middle of April and let it grow for use in early spring. As much as possible of the dairy area should be shut up in this way. Advice on the best paddocks to spell and the best method of feeding the autumn-saved pasture by the use of electric fences can be obtained from local officers of the Department of Agriculture.

Autumn Pasture Management

Seasonal Notes by the Extension Division

TWO of the most striking advances made in farming in recent years are discussed here. One of these is the chemical control of grass-grub, which now eliminates the previous uncertainty of pasture maintenance; the other relates to the improvement of South Island hill country that has been made possible by increased knowledge of soil requirements and the use of the aeroplane as a farm machine.

GRASS-GRUB CONTROL IN PASTURES

THE use of DDT to control grass-grub and porina (*Oxycanus*) in pastures has been one of the most important factors in the increase in carrying capacity attained over recent years. Improvements in techniques and in the materials available will make the practice still more effective. In addition to the normal dry mix, in which the superphosphate and DDT powder are mixed either by the farmer or by the fertiliser company, there is now available wet-mix DDT superphosphate with the DDT incorporated in the fertiliser during manufacture. Which of these products is used should depend on whether the application is to **prevent** grass-grub attack or to **control** an attack which has begun.

Prevention: Either wet-mix or dry-mix DDT superphosphate is satisfactory, but the lower cost and the greater uniformity of the wet mix make it particularly suitable. It should be applied initially at 2lb. of 100 per cent. para para isomer DDT per acre and at 1lb. per acre after 3 years if the quality of the pasture warrants treatment.

Control: Quick action of the material to kill grubs or at least make them inactive in feeding is essential. Hence the comparatively large particle size of the wet-mix DDT is unsatisfactory. A dry mix containing fine DDT (100 per cent. passing through a 200-mesh sieve and 95 per cent. through a 300-mesh sieve) is needed. It should again be applied at 2lb. of DDT per acre immediately damage is observed. Here also retreatment will be necessary after 3 years, but for this either dry mix or wet mix will be adequate.

A third form of DDT now available, pelleted DDT, may be applied by aircraft or spinner topdressers. Its efficiency as an insecticide depends very largely on the evenness of distribution of the pellets.

—*C. P. WHATMAN*

* * *

AERIAL SEEDING AND TOPDRESSING

THE most important feature of topdressing South Island hill country is the correction of nutrient deficiencies which limit nitrogen fixation through restricting growth of clover plants. The major deficiencies are of sulphur, phosphorus, and molybdenum. The use of molybdenised superphosphate corrects the three major deficiencies. Molybdenum deficiencies are somewhat scattered and farmers should consult local officers of the Department before applying molybdenised fertilisers.

Very large areas are deficient in sulphur, and fertilisers containing up to 400lb. of sulphur per ton are being recommended for use in many areas in Canterbury and in parts of Otago. Such a mixture when used at 1cwt. per acre will supply only about 2lb. less of phosphorus and three times as much sulphur as would 1cwt. of superphosphate.

Generally the recommended rates for topdressing are 1½cwt. to 2cwt. of superphosphate per acre (with molybdenum if advised), or where sulphur deficiency is known to be important 1cwt. of the mixture referred to above.

As the great majority of the marginal areas are devoid of good clovers, these must be included for the initial oversowing. The recommendations are 2lb. of Montgomery red clover and 2lb. to 3lb. of white clover per acre in all cases, and for the inclusion of 2lb. of alsike on the higher and wetter country. Subterranean clover might be considered on dry, open country, though the time oversowing is generally done is not suited for its use. Though the sowing of grasses is not generally recommended, cocksfoot and dogstail for open depleted country and timothy for high-rainfall areas could be considered.

From experimental and practical experience oversowings should be done in winter, June and July being favourable months. Rainfall has a bearing on this, and on the higher-rainfall inland areas and at the higher altitudes oversowings can continue into August and even September if late springs are the rule and early summer droughts do not occur.

Areas should not be overgrazed before sowing and should not be stocked during the period of germination in spring.

A few isolated areas are now known to have associated clover inoculation problems and it is advisable to consult local officers of the Department if difficulties are experienced in getting good establishment of clovers.

—*W. R. LOBB*

* * *

AUTUMN SOWING OF PASTURES

THERE are three essential factors in the establishment of pastures: Fertility of the land must be high enough to support the pasture plants, the seed-bed must be properly prepared, and the most suitable pasture mixture must be used. Clovers sown too late in autumn will not have the same opportunity to establish as they would with earlier sowings, and in the colder districts early frosts have a very adverse effect on clover growth.

If a nurse crop is used with autumn-sown pasture, care should be taken that it does not smother the grass and clovers. The use of a nurse crop is not generally advocated, but if it is used, feeding off should not be delayed too long. For best results grazing should begin as soon as the grasses and clovers are sufficiently rooted to resist being pulled out by the animals.

Where a short-term pasture or special-purpose pasture is required Italian ryegrass or short-rotation ryegrass with broad red clover and white clover can be autumn sown.

—*W. C. FAITHFUL*

* * *

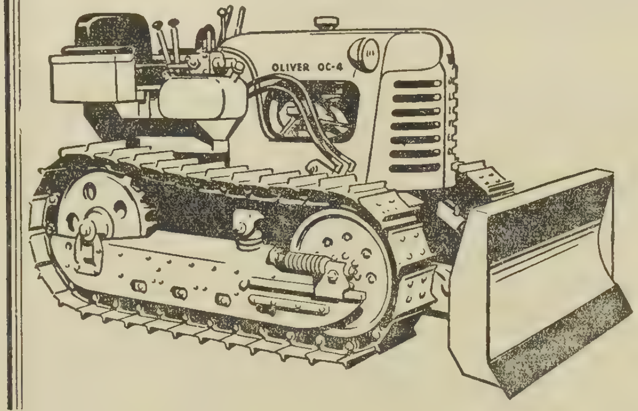
AUTUMN TOPDRESSING ON THE DAIRY FARM

BUTTERFAT production for next season depends a good deal on the vigour and composition of the pastures in spring and early summer. Both the composition, which is important because grassy pastures are generally much more productive than clovery ones, and the vigour, which is shown by the quickness of recovery after each grazing, can be improved very much by topdressing early in autumn with the right fertilisers.

For good results autumn topdressing should be applied early to allow the clovers to make strong growth with the autumn rains and it should be applied to pastures that have both good clovers and good grasses, the clovers to respond to the fertilisers and the grasses to make full use of the nitrogen gathered by the clovers. If either grasses or clovers are missing, steps should be taken to correct the position; otherwise the fertiliser can be wasted.

The fertiliser requirements of most dairy farm soils are now fairly well known, and advice is available from the Extension Division whether phosphate, potash, sulphur, lime, or one or other of the minor elements alone or in mixtures is required to get the best clover response.

—*A. C. BURGESS*



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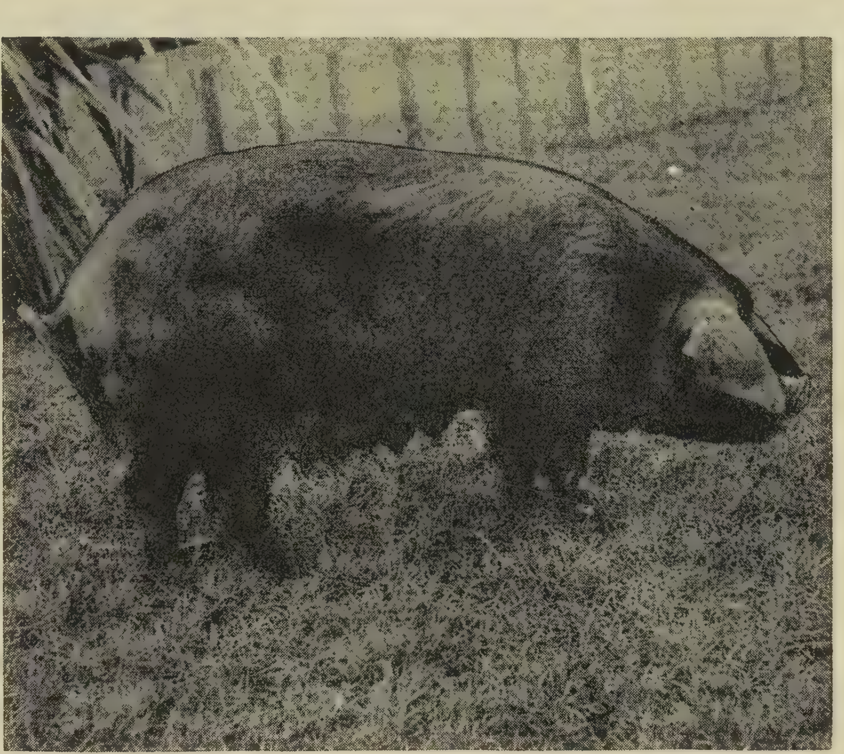
Preparation for Winter Farrowing

LARGE numbers of sows throughout the country will be farrowing in May and June. Whether they produce big, strong litters of healthy piglets depends very much on the treatment they receive during the next 2 months. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, discusses the treatment they should receive.

AT this time of the year, when the farmer is faced with a rapidly falling supply of skimmed milk or whey and in addition often has a considerable number of pigs on hand that he is anxious to get rid of as porkers or baconers before the end of the dairying season, breeding sows are often left to fend for themselves and to live as best they can on pasture, not always of particularly good quality.

It is quite remarkable what good performances some sows succeed in giving under these conditions, but there is no doubt that the poor results so often obtained in winter litters are largely caused by the neglect of breeding sows in late autumn.

The most important point is the necessity of building up and keeping up the condition of the in-pig sow. A good sow will always lose condition while suckling a litter and unless that lost condition is put back on to the sow after weaning and kept on her while she is carrying her next litter, she will not do so well at hér next farrowing.



A newly weaned sow. A sow loses condition while suckling a litter and that loss has to be regained if she is to produce good results at her next farrowing.

Value of Home-grown Crops

Steps should always be taken to compensate for the fall in dairy by-products that occurs in autumn. Home-grown crops are the most economical way of doing this. A crop of fodder beet will benefit considerably by being thinned at this time of year and the thinnings, including the tops, are most useful for feeding to pigs.

A most valuable crop that can be sown in almost any part of the country is barley. A crop of barley grown for pigs can be harvested entirely satisfactorily with an ordinary mower and a hay baler. Additional value can be given to barley by growing peas with it. If a combined crop of peas and barley is cut and baled, all that is necessary is to open up a bale and leave the pigs to do the rest; they will not miss a single grain.

The use of meat meal is necessary with both fodder beet and barley to supply the protein in the ration. If home-grown feed is not available, bought meal, preferably barley, should be used.

Supplementary feed can and should be provided and breeding sows should be fed as follows:—

For the first 6 weeks after weaning at least 5 or 6 food units a day should be provided. If no dairy by-products are available, this feed can be given as 2lb. of a mixture of two-thirds barley meal and one-third meat meal

Proper feeding of breeding sows while they are carrying a litter is the most important part of management. This sow is in good condition for farrowing.

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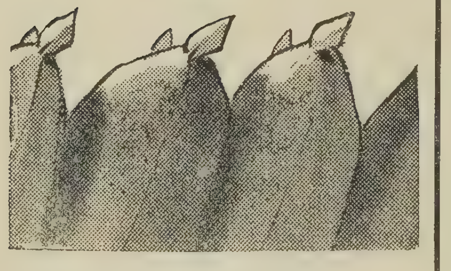

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plus fodder beet to appetite. For the next 5 weeks, or as soon as the sow has regained the condition she lost while suckling, the amount of food can be cut down to 2 food units per day, given as, say, ½lb. of meal and 10lb. of fodder beet, and the balance made up with grazing on the best pasture it is possible to put the sows on.

During the last month before farrowing feed should be increased to 4 to 5 food units a day and the amount of meat meal should be increased to at least 1lb. per day. At this time the demands of the unborn litter increase at a much greater rate than at any other time during pregnancy. A shortage of food then, particularly of protein, can undoubtedly cause a reduction in the number of live pigs born.

Proper feeding of breeding sows while they are carrying a litter of pigs is by far the most important part in management to obtain really good results at farrowing, and neglect of it is probably the biggest cause of poor litter results.

Home-grown crops such as fodder beet are the most economical way of making up loss of feed through the fall in the quantity of dairy products in autumn.

Among other points that need attention is constipation. Sows must be watched for this, particularly if they are more or less confined and being fed largely on meal. If this is troublesome, bran should be added to the ration. Constipation in pregnant sows is not a very common problem in New Zealand, as sows generally are given almost free range on pasture.

If home-grown feed is not available to supplement the sows' feed, bought meal should be used.

Sows get all the exercise they require on New Zealand farms without any special attention to this point by the owner.

Housing

The housing provided for in-pig sows does not need to be elaborate as long as it is draught-proof and dry. A semi-open-fronted house facing away from the prevailing cold wind and bad weather—in most districts this would mean facing approximately north or north-east—is quite satisfactory. A concrete feeding platform with feeding stalls over the trough is a necessity if proper control over the feed given is to be achieved. This should be placed in a position handy to the feed supply, as it is much easier for the pigs to walk to their food than for it to be carried to them.

A little care and attention, particularly in regard to adequate feeding to maintain condition, given to in-pig sows for the next 2 months will pay a very handsome dividend in bigger, stronger litters of pigs when sows farrow in May and June. This will mean a good start to next season's pig production, and pig production is likely to become increasingly important to the dairy farmer in the near future.

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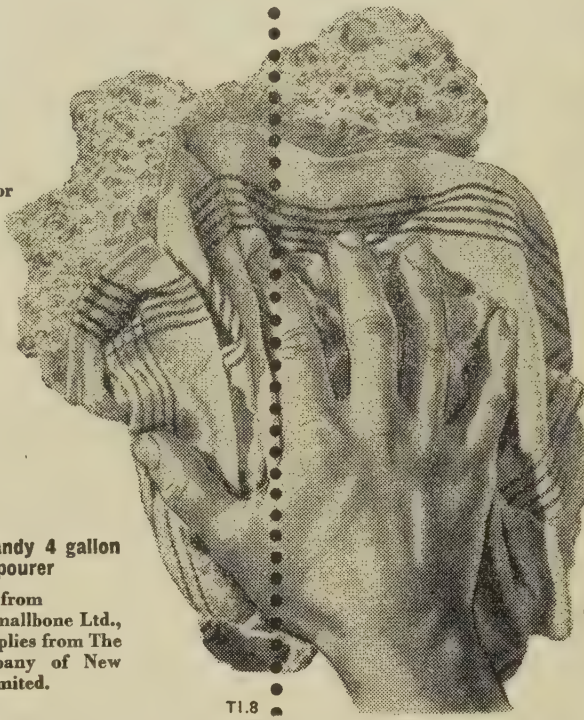

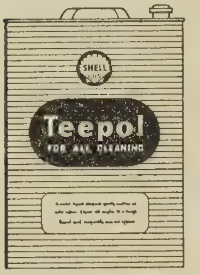

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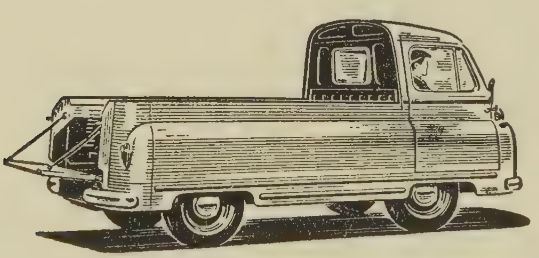

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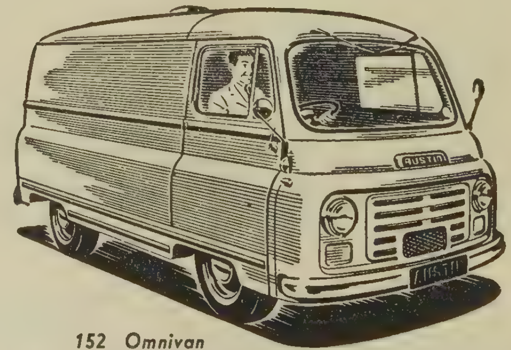

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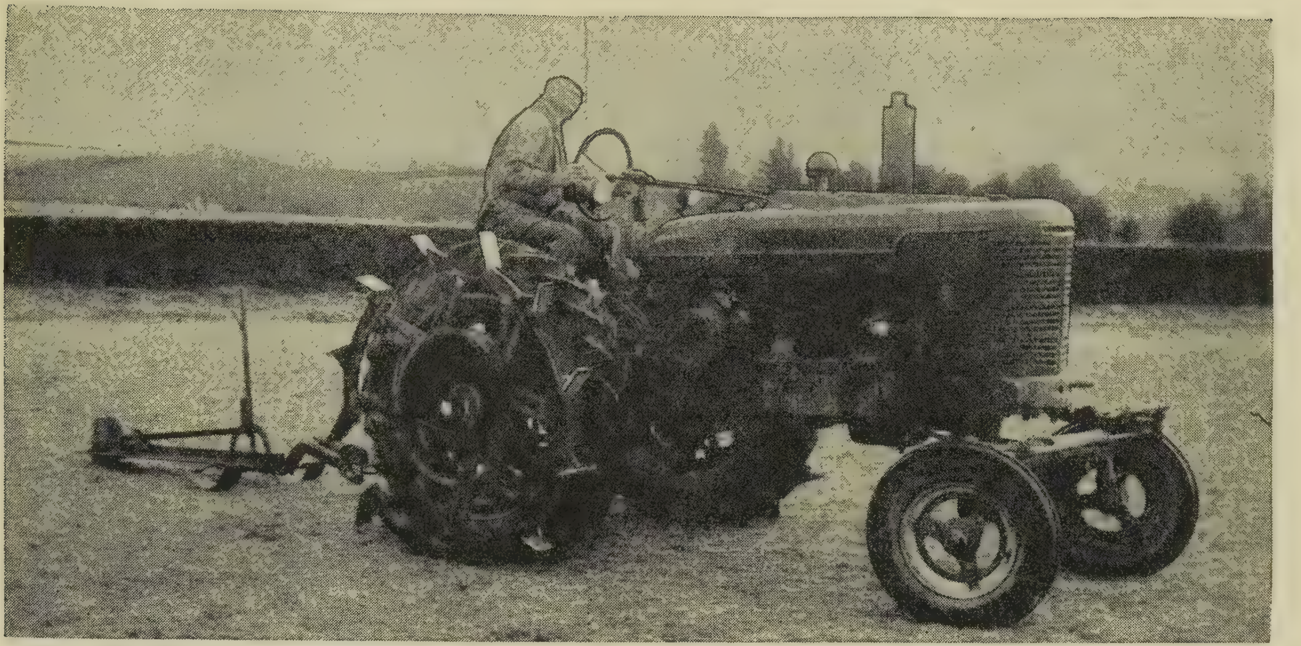


Wheel Grips Increase Tractor Safety

THOUGH all wheeled tractor fatalities cannot be directly attributed to lack of sufficient wheel grip, it has been a dominant factor in many, particularly in hilly country. In this article C. M. B. Olivecrona, Machinery Instructor, Department of Agriculture, Wellington, discusses the use of wheel grips on tractors fitted with pneumatic tyres.

AS the demand for more land and production in New Zealand grows, increasing use will be made of undulating and hilly country. The use of heavy tractors, both wheeled and tracklaying, will increase too for there must be a reserve of power in tractors used on this type of land that is not so necessary on flat land. This reserve of power is necessary because stalling on a hillside can cause serious trouble, but stalling on a flat surface may mean nothing more than restarting the engine and adjusting the load. On flat country too, extra traction can often be successfully obtained by the addition of extra weight to the rear wheels either in the form of wheel weights or by the filling of the tyres with water. The same effect can also be gained with a weight transfer system when trailed implements are being used.

Tractor Tyre Treads

The necessity for higher powered tractors and the introduction of low pressure pneumatic tyres pinpoint one of the problems of machine working of hill country with wheeled tractors—tractor wheels and tyres, unlike those of cars or trucks, are designed specially for pulling heavy loads.

If conditions are muddy or slippery, tractor tyre treads will give better traction when moving forward than when in reverse, because their lugs or cleats are designed for this purpose; on bitumen or tar seal they would perform equally well in either direction. They usually have arrows that indicate the direction of rotation for the best work. Because of the ability of these tyres to give maximum performance while moving forward through mud or heavy conditions it is advisable, if not necessary, to fit wheel grips when hills are being worked, as the action of braking a wheel shod with these tyres on a hillside is similar to going into reverse on a flat surface. The cleats or lugs that are designed for cleaning themselves when in mud and moving forward will become clogged and their efficiency will fall by a minimum of 6 to 8 per cent. in average conditions to complete loss of traction in very muddy conditions.

Fig. 1 shows some patterns of tractor tyres that have directional mud-gripping or self-cleaning treads, the cleats or lugs being placed not straight across the tyre but at an angle to the

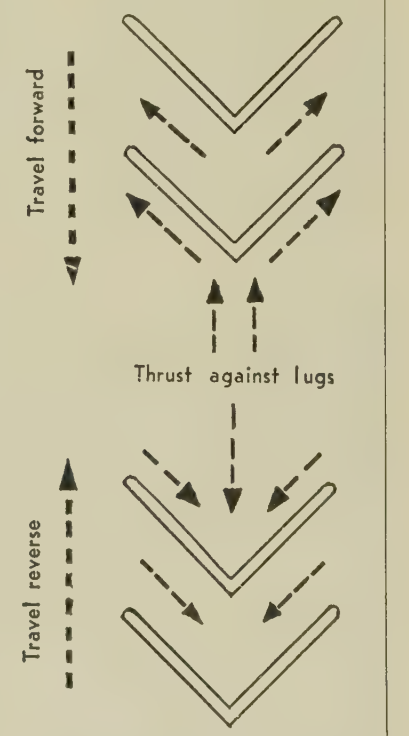


Fig. 1—Directional tread or self-cleaning mud-grip tyres. Upper: Angle of lugs to thrust forces mud out. Lower: Angle of lugs to thrust packs mud in.

HEADING PHOTOGRAPH: Wheel grips, such as those on this tractor, greatly increase tractor efficiency and safety on slippery ground.

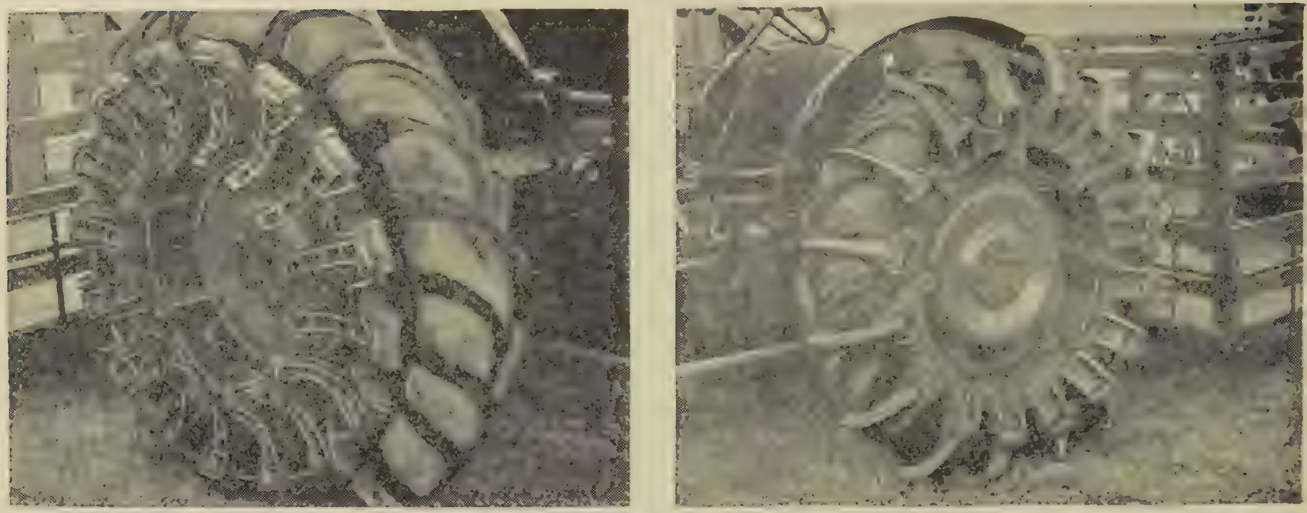


Fig. 2—Left: Opperman wheel grips, retracted. Right: The same type of wheel grip extended ready for use.

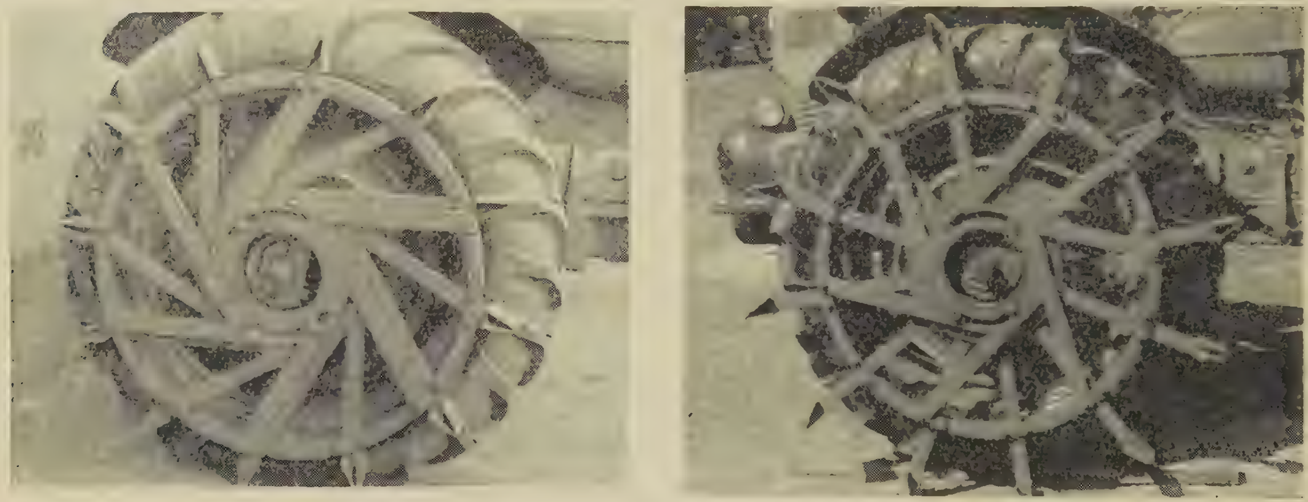


Fig. 3—Left: Darvill-Stanhay grips, retracted. Right: The same grips in the extended position.

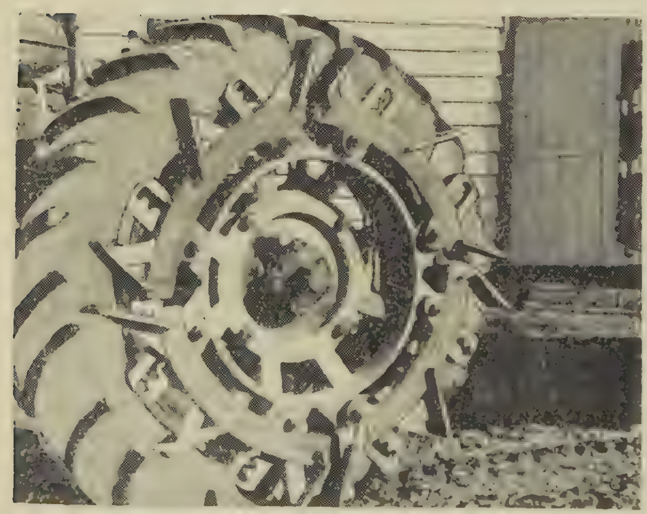


Fig. 4—Invercargill or Vulcan grips another type of retractable wheel grip.

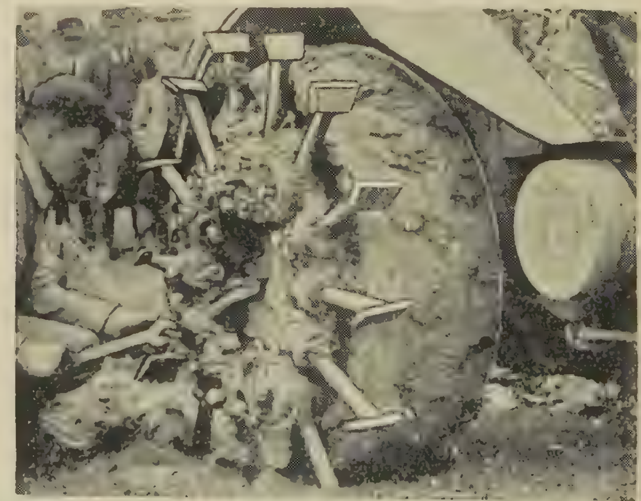
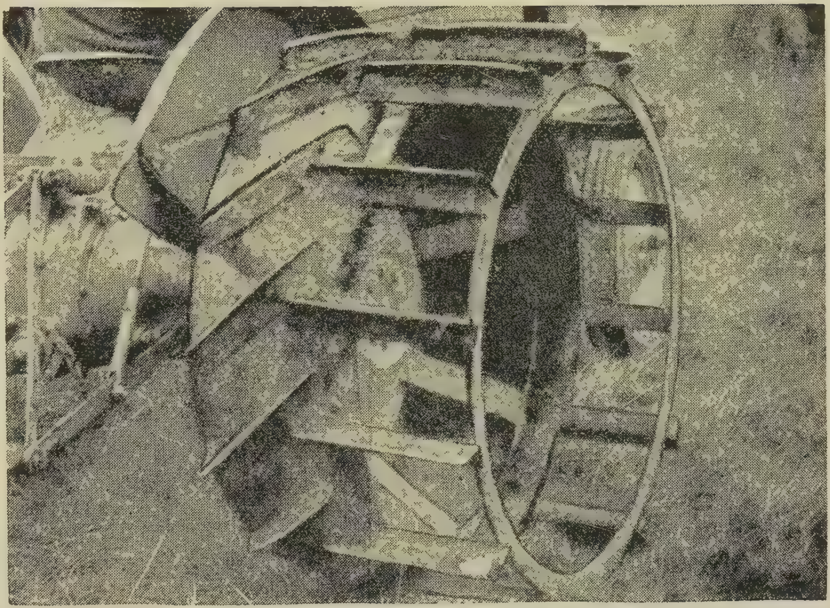
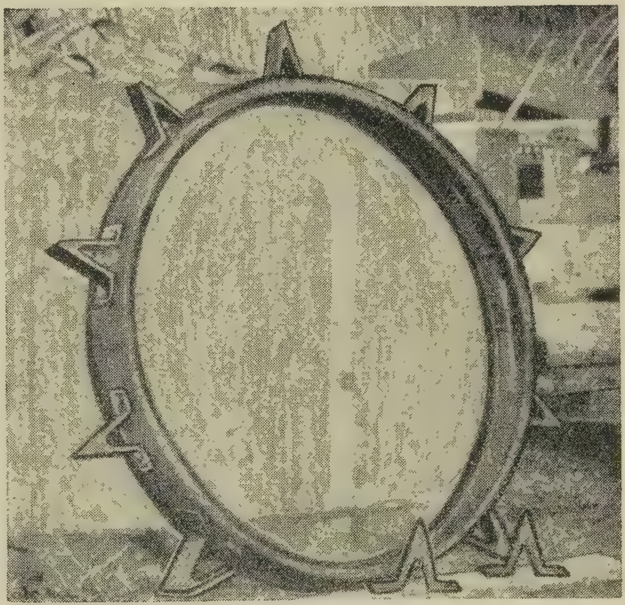


Fig. 5—Bower wheel attached with lugs extended. Depth of penetration can be varied up to about 6in.



▲ A cage-type wheel. Cage wheels are best suited to very boggy conditions.

Fig. 6.



An extension ➔ wheel. This type can be used on tractors fitted with either pneumatic tyres or steel wheels.

direction of rotation and travel. This design of the lugs or cleats makes the fitting of wheel grips so necessary when on hill country, for though the lugs tend to clean themselves when the tractor is travelling forward, they will clog up when the tractor is moving in reverse, as in Fig. 1. When this happens their efficiency will fall in accordance with the degree of clogging that takes place in the lugs or cleats.

A tractor shod with "directional tread" tyres that had just enough traction to take it up a hill with a load would be unlikely to have sufficient grip of the ground to give full control when it came down the same grade with the same load if conditions were at all muddy or greasy.

Loss of Traction

Loss of traction occurs most commonly under the following conditions: Rain and mud, wet grass, grass that has frost or even heavy dew on it, and very dry or longish grass on a slope; there are other conditions that can also cause loss of traction (surface adhesion).

If any of these conditions occur on a hillside, their effect is accentuated and the danger increased. For example, a tractor with rubber tyres can sledge dangerously down a grassy slope covered with frost, but similar conditions on the flat would merely make the wheels spin. Fitting of wheel grips in most cases is a wise precaution.

Tyre Rolling or Ballooning

Tyre rolling or ballooning occurs when a tractor is travelling along a hillside. Tractor tyres are inflated only to from 12lb. to 14lb. per square inch, and though manufacturers have strengthened tyre walls in recent years, there is always a certain amount of roll when tractors travel across the face of steep sidelings. This rolling moves the centre of gravity outward and thus accentuates side creeping of the tractor. Strong wheel grips or tyre girdles will counteract this tendency considerably. From this aspect alone wheel grips are worth fitting on hill country.

Types of Wheel Grips

There are a variety of wheel grip devices on the market variously known as extensions, extension wheels, cage wheels, wheel grips, grippers, wheel strakes or strakes, girdles, and tyre chains. Wheel grips may or may not be permanently attached to the tractor. A permanent gripping device is one that can be left attached to the tractor wheel whether or not it is being used to prevent wheel slip.

Retractable Wheel Grips

The first group of wheel grips comprises those that are usually permanently attached to the tractor wheels and are retractable lugs, grips, or strakes that can be extended or retracted at the will of the operator. The use of these grips is almost wholly confined to tractors fitted with pneumatic tyres. When not being used these grips act as wheel weight and as such also assist in traction, but care should be taken in their selection to ensure that they are suitable for the type of tractor and the work to be undertaken.

Figs. 2, 3, 4, and 5 show this type.

Extension Wheels and Cage Wheels

The second group comprises non-retractable lugs that are attached to tractors working in wet or slippery conditions and which may be removed when not required. These are extension wheels or wheel extensions and can be used on tractors fitted with either pneumatic tyres or steel wheels. They are rigid and once fitted can usually be depended on (Fig. 6). Cage wheels come into this class and are a modern revival of the old idea known as sieve grips that were fitted to some of the first tractors made. They are like extension wheels and are dependable once fitted, but are really more suited to very boggy conditions such as in rice fields.

Chains

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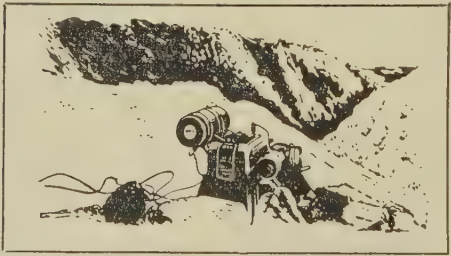

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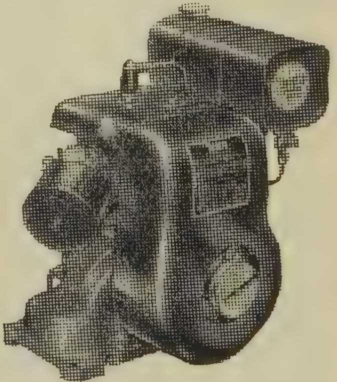

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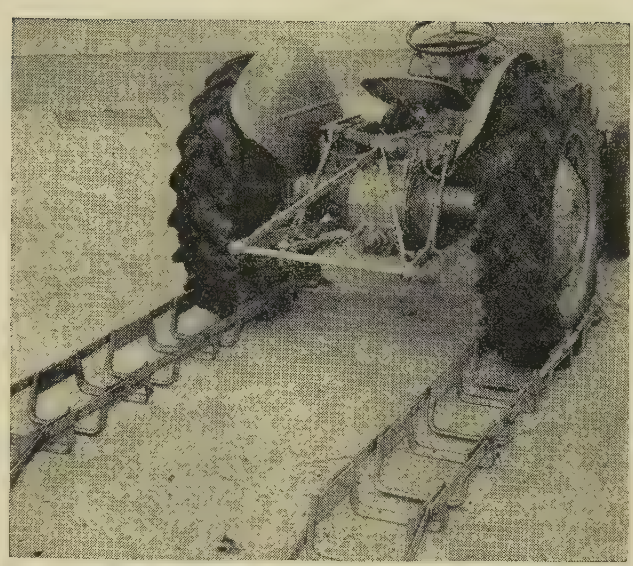
signed for tractor work, may also be used. They are usually very heavy and robust and should have a tightening device incorporated to prevent the wheel from revolving inside the chain. Care should be taken in the selection of chain type grips to see that there are no plates or gripping attachments that can wear into the tyre.

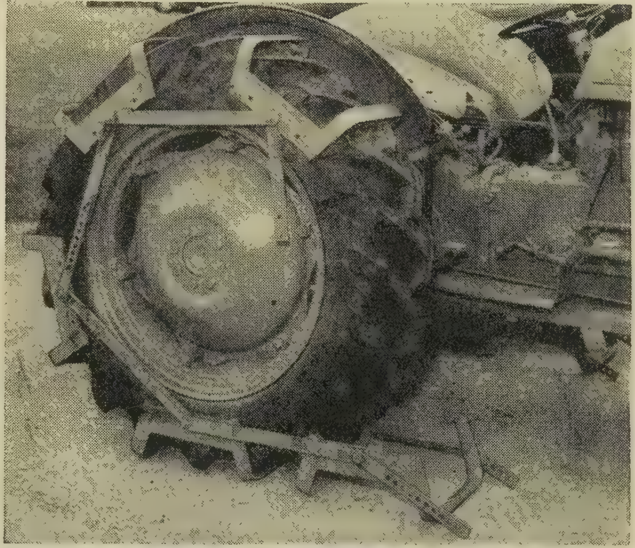
Tyre Girdles

Tyre girdles are one of the newer types of wheel grip that consist of an open cage, made of flat steel and half-round bars fitted with adjusters for length and tension, that fits round the wheel similar to a set of tyre chains. Fig. 7 shows this type. Tyre girdles can have extra gripping lugs attached if necessary.

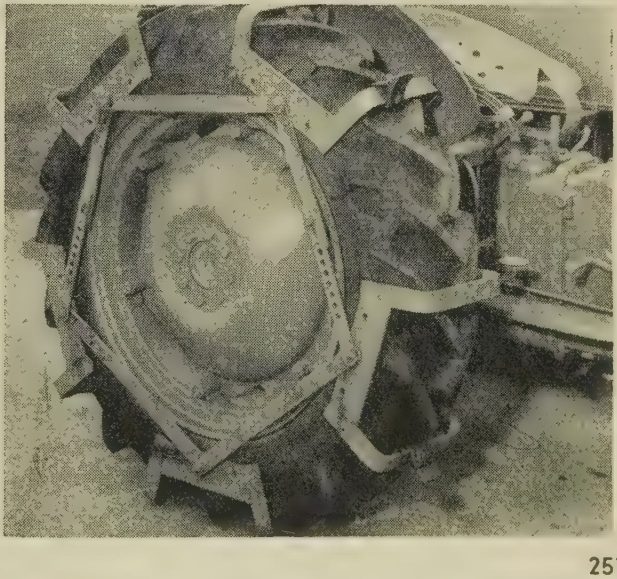
Fig. 7—Attaching of tyre girdles.



Girdles laid out for attachment. They are made of flat steel and half-round bars fitted with adjusters for length and tension.



The tyre girdles in position and ready for tightening. Extra gripping lugs can be attached if necessary.



The girdle in place with lugs attached. Tyre girdles are one of the newer types of wheel grip.

Patterns of Lugs

Lug patterns differ and each has its own peculiar advantages or disadvantages. They comprise four main categories:—

1. Straight or spade lug, where the lug face is a prolongation of the radius of the wheel, as in Fig. 8.
2. Where the lug face has two angles to the radius, as in Fig. 9.
3. Where the lug face forms an angle to the radius of the wheel, as in Fig. 10. Lug patterns as shown in Figs. 8 and 9 would give equal traction backward and forward; that in Fig. 10 would give very good traction forward, but would not be so efficient in reverse (see Fig. 11). This type of lug is also known as the paddle grip.
4. A type of lug that can have its angle altered according to the direction of travel of the tractor. This lug pattern would have the advantage of the angled lug for forward traction but none of its disadvantages when in reverse or when braking. The hinged lugs of this pattern can be seen in Fig. 12.

Methods of Attaching

Wheel grips are usually attached to either the hub of the wheel or the rim. Neither method has any particular advantage over the other and both have proved satisfactory. Figs. 2 and 3 show attachments to the rim and to the hub respectively.

Position of Attachment

Figs. 4 and 13 show the position of attachment. The method in Fig. 12 with the grips on the outside of wheels is the more popular. The method in Fig. 13 with the grips on the inside of the wheel is often used and has many good features—the point of maximum traction is closer to the source of power and less strain is thus put on wheel bearings when a solid obstacle is struck. Moreover if the tractor is fitted with guards, mud brought up on

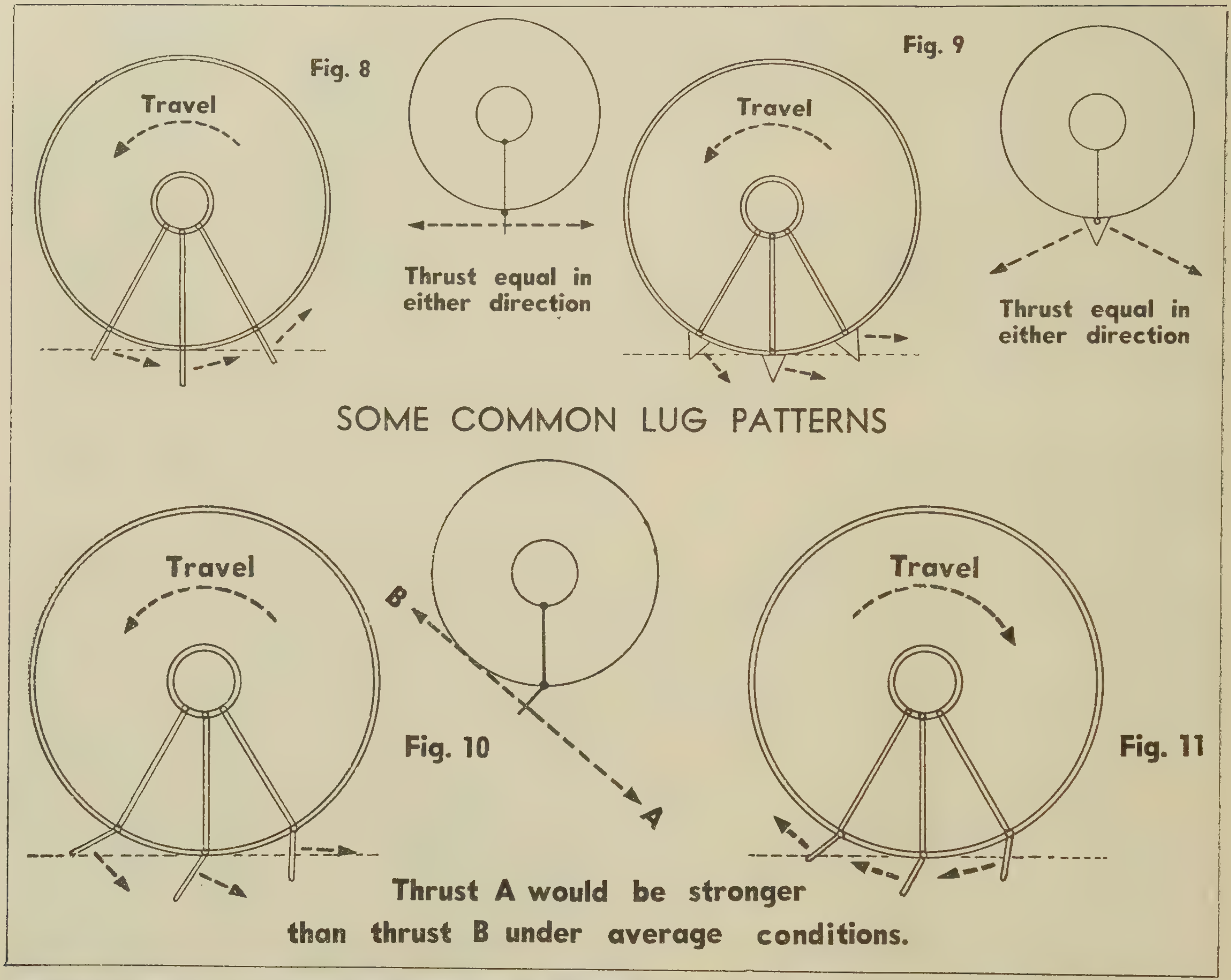


Fig. 8
Travel
Thrust equal in either direction
Fig. 9
Travel
Thrust equal in either direction
Travel
B
A
Fig. 10
Travel
Fig. 11

SOME COMMON LUG PATTERNS

Thrust A would be stronger than thrust B under average conditions.

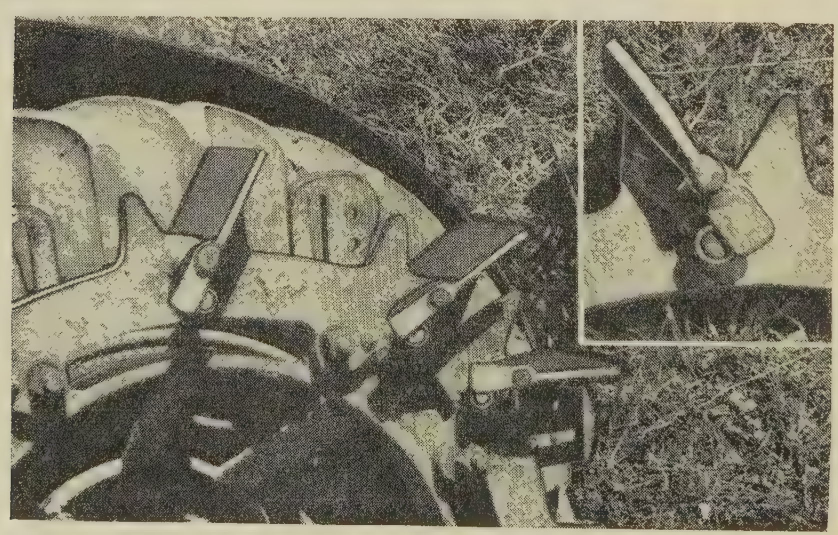
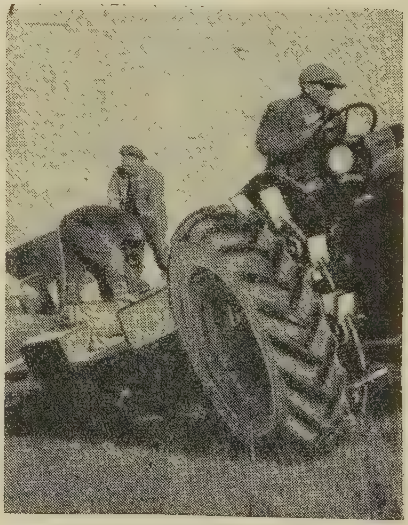


Fig. 12—Left: A type of wheel grip that can have the angle of its lugs altered according to the direction of travel or for braking effect. Inset: A close-up of this type of lug, showing how the lugs swivel on an axis to meet the requirements of forward or backward (and braking) thrust.



[*Campbell*

Fig. 13—Grips set inside the wheels. (See Fig. 4 for alternative outside position.)

the lugs is less likely to reach the driver. Disadvantages are that being on the inside of the wheel grip the lugs are not quite as easy to fit or adjust.

When fitted on the outside of the tractor wheels, extensions or grippers increase the over-all width of the wheel tread and in this manner can give increased stability on hillsides. This combined with easier accessibility makes this method of attachment the most popular with tractor users.

Relation of Lugs

Fig. 14a shows the most common method of placing lugs in relation to tyre tread. With this arrangement the total width of the tyre and gripper in contact with the ground is greater than in the method shown in Fig. 14b or with chains. Grips attached as in Fig. 14b would increase the traction of the wheel without increasing the area in contact with the ground, but those fitted as in Fig. 14a would give increased traction over a greater area of ground contact. They would also tend to give stability in countering side tipping to some degree, but would naturally not eliminate it.

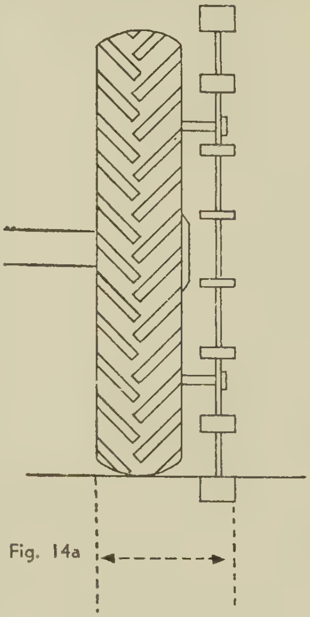


Fig. 14a

Area of ground contact

Overall area of ground contact increased as well as grip

Would apply to extension wheels, some types of retractable grips, and cage wheels

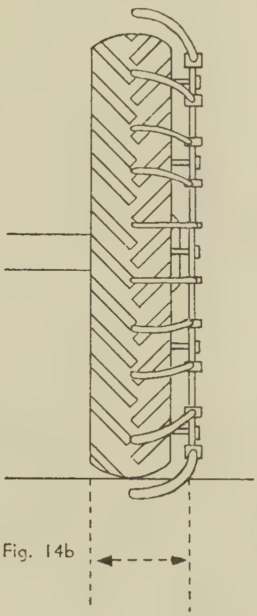


Fig. 14b

Area of ground contact

Grip increased but not area of ground contact

Would apply to chains, girdles, and overlapping strakes

An argument often used against the use of wheel grips is that the increased wheel traction achieved by their use aggravates the tendency of the tractor to rear. This theory can be discounted when grips similar to those in Fig. 14b or chains are used, as they merely give a tractor in extremely muddy conditions the same grip its tyres would have on dry ground; they do not increase the area of ground contact to any extent, but they improve adhesion.

Where wheel grips of any kind are fitted to increase traction, operators should not be tempted (because of the increased traction available) to take their tractors up slopes that are steeper than those they would usually negotiate or attempt and that they would regard as within the scope or safe operation of the machine. Wheel grips may enable the tractor to reach a dangerous position.

Suitability of Grips

The variety of wheel grips at present available enables tractor owners to provide better traction for their machines in wet conditions or on hills, but care is needed in the selection of grips suitable for particular machines and conditions. Principal requirements in grips are:—

They should stay fixed in the position selected by the operator. Some types of grips have the lugs on extendable arms that are liable to twist if a solid object is struck; the lug turns and instead of getting a good grip of the ground will lie sideways or slide back into its socket, thus giving only a small amount of additional grip or none at all.

They should not be cumbersome. If extension wheels or wheel grips are heavy and hard to handle, the operator may hesitate to use them when their use is advisable. The heaviest grip is not always the best.

They should be easily and quickly extended or retracted and attached or detached. This applies more to the retractable types of grips than to extension or cage wheels. If grips take a long time to extend or retract, their use will often be neglected when it is advisable.

They should be strong and durable. Unless a wheel grip is reasonably well constructed of dependable material, and gives equal traction in both directions, it may as well not be fitted if hill country is being worked. The desirability of equal traction in both directions is not so important on flat land, but it should be borne in mind when wheel grips are being selected.

It is most important that gripping lugs should be able to be fixed firmly and securely in the off position so that there will be no possible danger of their coming loose while the tractor is travelling from place to place or on roads. The centrifugal force of high road speeds can work the retractable lugs loose, and has done so causing serious injury to both driver and machine. Periodic inspection of bolts, nuts, lugs, and the moving parts of retractable gripper components is a wise and necessary precaution.

Reasons for Grips

The safety aspect cannot be stressed too highly, but it is often advisable to fit wheel grips for other reasons. These are the saving of fuel by minimising wheel slip and the protection of the tyre from excessive abrasion that is also caused by wheel spin. The saving of fuel and the lengthening of the general life of tyres should be sufficient inducement for most farmers to consider the fitting of suitable wheel grips if conditions are muddy or if hills are to be negotiated.

Effect on Surface

The gripping lugs of all wheel attachments will have a piercing or cutting effect on the land over which they pass. On already cultivated areas this is not of great importance, but sometimes it is necessary to preserve the unbroken surface as far as is possible and at the same time to get sufficient surface adhesion to carry out routine jobs about the farm. When this happens a study of lug patterns in Fig. 8 will perhaps be informative. The marks left by lugs similar to those of Fig. 8 or 9 would probably be deepest and most severe while those of Fig. 10 the least penetrating, provided that the tractor was moving forward and pulling a load.

The point of entry of the lug to the soil and the angle at which it leaves have a definite bearing on the subsequent condition of the surface. Most wheel grips aim at getting the maximum surface adhesion with the least amount of damage to the surface. Some soil types stand up to surface abrasion better than others and some thought could be given to the lug pattern or design of wheel grip that would be most suitable for the particular area where it is to be used.

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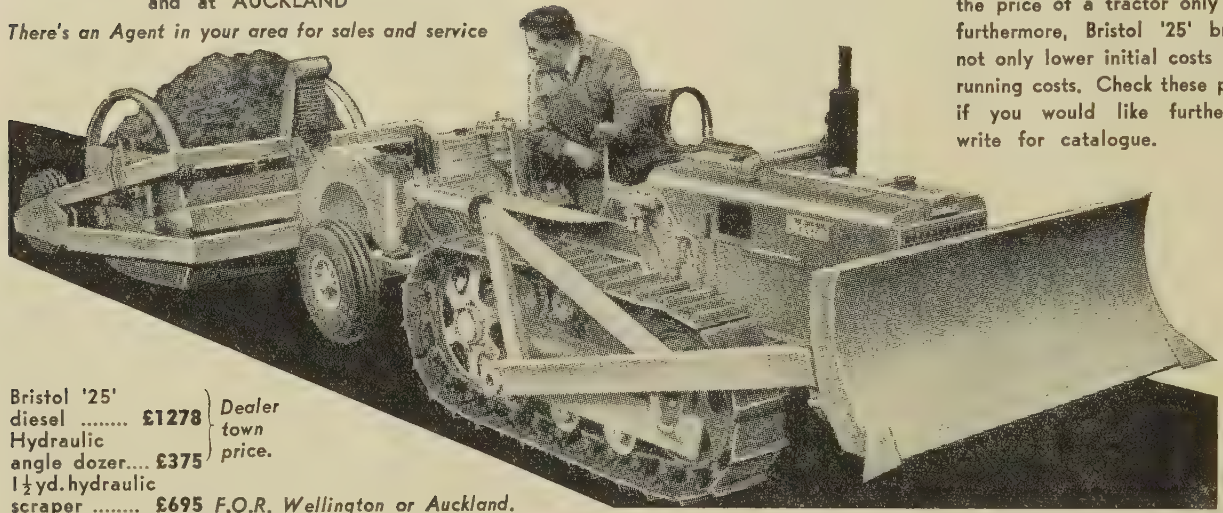

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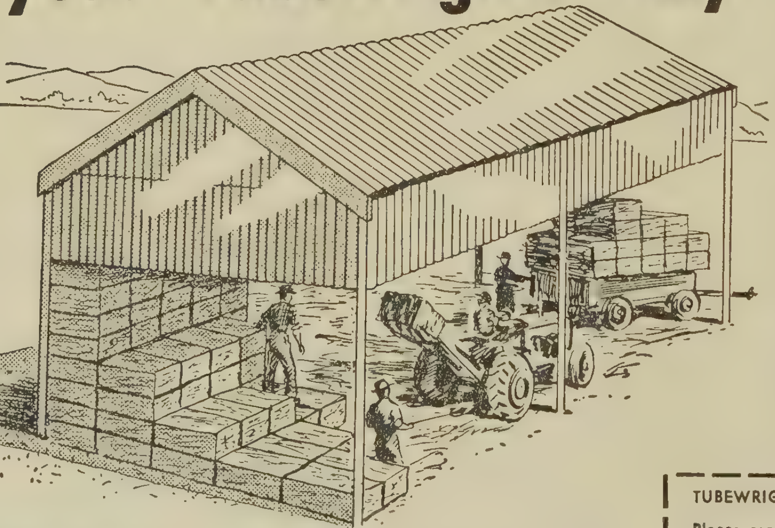

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Value of Standard Hive Equipment

FOR the production of good crops of honey, bees require to be housed in sound hive equipment. Ideas on what is the correct type of hive to use vary from country to country, but in New Zealand a standard hive is almost exclusively used. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, analyses new ideas which have been tried in New Zealand and shows the disadvantages of departing from the use of the present standard hive.

BEFORE 1908 anyone keeping bees in New Zealand could house them under whatever conditions he fancied. Many kept bees in gin cases, as apparently these were readily obtainable then. The progressive beekeeper imported his hive equipment from America until manufacture began in New Zealand.

With the passing of the first Apiaries Act in 1908 it became compulsory for beekeepers to keep bees in hives which had combs that could be removed readily for the detection of bee diseases.

The pioneers of the industry at that time very wisely concentrated on the Langstroth type of hive, and all beekeepers were encouraged to construct equipment to this pattern. For 50 years beekeepers in New Zealand have retained the Langstroth hive and have benefited greatly as the result.

In England individual preferences have resulted in the development of many different types of hive with practically none of the parts interchangeable. Therefore manufacturers and stockists have to carry perhaps as many as 20 kinds of hives. This in itself tends to make the price much higher.

Over the years there appear to have been no really sound results which would indicate that one hive is better than another. The keeping of bees is primarily for the production of honey and beeswax and a pollination service to the community, and the results are tied up principally with colony management and seasonal conditions, such as weather and abundance of nectar-bearing flowers. The type of hive is of secondary consideration only as far as results are concerned.

But when hives are considered as a capital asset the type is very important in the general stability of a beekeeper's outfit. During the rehabilitation of many ex-servicemen into the beekeeping industry it was comparatively easy to assess the value of hives which were being bought because the equipment was standard. The confusion could well be imagined if several

An apiary built up of non-standard equipment.

▼ Pile of equipment, which though of use in the non-standard hives of the apiary for which it is designed, is useless to the great majority of beekeepers, who use standard hives.

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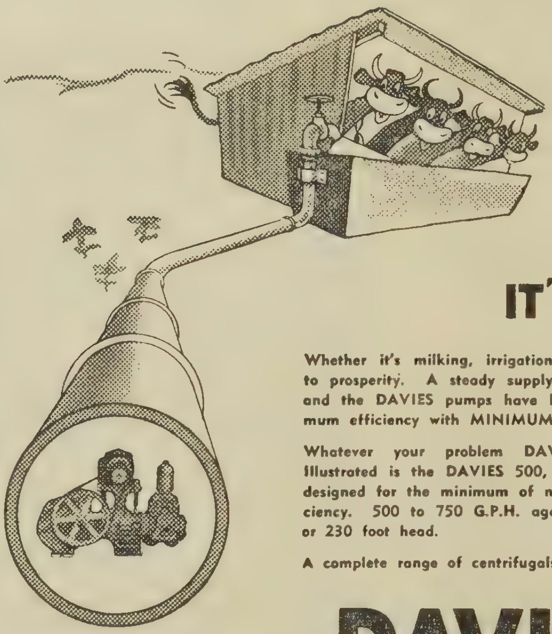

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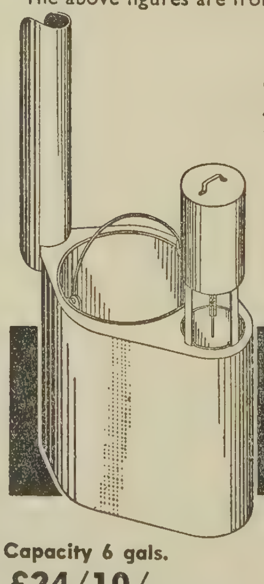

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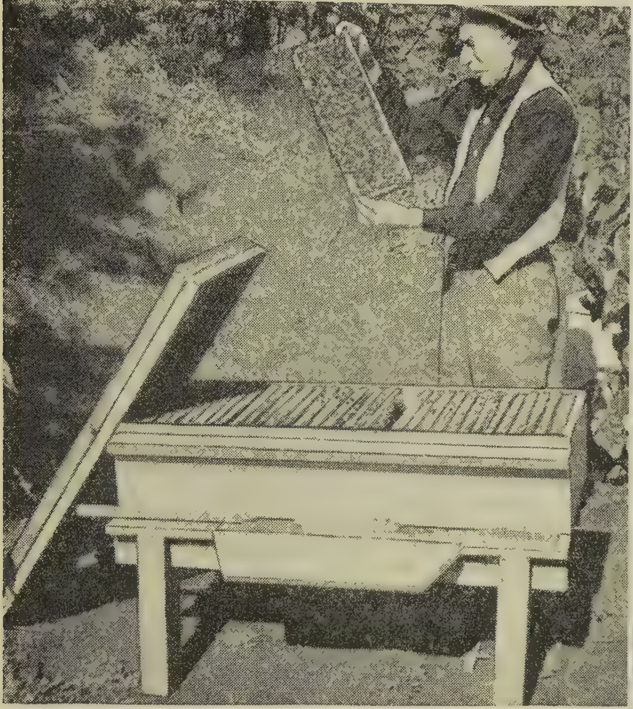
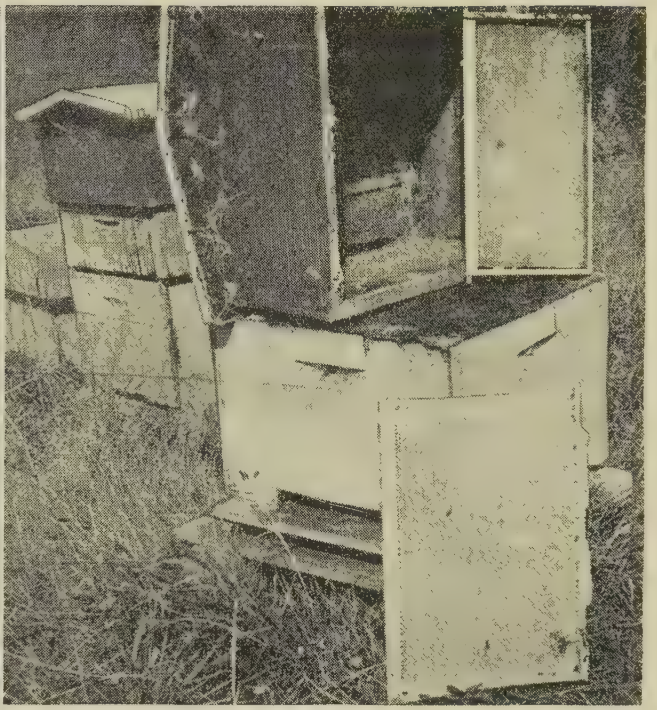


Making an inspection of a long idea hive.



Note the standard frame on top of the hive as compared to the frame below with its extra depth. Many combs similar to this one were perfectly drawn out.

types of hives were in use all over the country. One or two commercial beekeepers at times have changed over to a hive foreign to this country. There has been no evidence that they ever secured better crops, but they very soon realised their error and have over the years attempted to replace the equipment with standard hives.

Many new settlers in New Zealand are interested in beekeeping, and though it would be natural for them to consider introducing the hive types used in their homelands, fortunately there has so far been no evidence of this. Newcomers have listened to the advice of local beekeepers and officers of the Department of Agriculture, and have followed the example set in confining establishment to standard equipment.

In the past several beekeepers influenced by the advantages expounded of a new type of hive in overseas beekeeping journals have set up the new equipment, but the results in no case have shown any outstanding gain over the standard hive. Some of the ideas which have been tried are set out below.

The Long Idea Hive

About the 1920s the idea was conceived that instead of allowing for the natural increase in colony strength of a hive upward, there would be many advantages in what was called the long idea hive.

This was a long hive capable of holding from 30 to 40 frames, the idea being that the queen could move sideways in her brood rearing. The supers that were placed on top would then be filled with honey and could be moved readily.

This equipment was expensive to make up and was not adaptable to large-scale honey production where apiaries had to be moved around. About 20 years ago the writer observed the operation of these hives in two apiaries, and the results never equalled the returns secured by neighbouring beekeepers who used standard equipment.

The Square Hive

The square hive was of the same dimensions as the standard hive except that the width was greater, being equal to the length. It held 12 frames and its exponents held that hive management could be simplified because the queen had a larger number of frames for her brood. In addition the hives were not so easily tipped over by stock.

When the top supers became filled with honey, however, it required a man in the peak of physical condition to remove one and place it on a truck. There are still a few apiaries throughout the country stocked with this type of hive, but they have their labour troubles, as workers never appear to remain very long.

Double-walled Hive

In many countries where winters are severe it is necessary either to remove the hives into a cellar for winter or to wrap them up carefully with tarred paper or other protective material. A few beekeepers in this country considered that bees would winter better if given extra protection, so a deep-fitting lid was developed. This was a gable-type lid but with the side deep enough to telescope right over the hive, thus giving a double-wall protection to the hive. However, experience had shown that in New Zealand this protection was not necessary, and as well the special equipment was extremely difficult to handle. Sometimes it was very hard to get the lid to slide over the hive, and very often when it did go on it was almost impossible to remove it again.

Though many individual hives based on English patterns have been seen at times, the owner soon realises that if he wishes to build up an asset, he must use standard hive equipment.

Full particulars of the dimensions and construction of standard equipment can be obtained from local Apiary Instructors or by writing to any office of the Department of Agriculture for a leaflet on the subject.

Well-maintained standard equipment is a pleasure to work with and has a good resale value.

Precautions to Keep Household Poultry Free of Worms

WORMS are found in poultry as they are in other domesticated animals. They need not cause concern, as they are easily destroyed, but the possibility of their presence in laying pullets should not be overlooked. In this article by the Animal Industry Division, Department of Agriculture, precautions which should be taken by household poultry keepers are discussed.

THE large roundworm of poultry is the only parasite worm that needs to be considered by the household poultry keeper. It is common in poultry and when present in small numbers does not appear to injure the birds, so that the owner is rarely aware that his birds are infested. When present in large numbers, however, the worms can do considerable harm to poultry.

It is important that these worms should be destroyed when they are present in small numbers because otherwise they may build up until they become a menace to the birds. Consequently it is unwise to adopt a complacent attitude toward these parasites, even if they do not appear to be present and doing damage. It is probably wise for householders purchasing new birds to assume that worms may be present and to act accordingly.

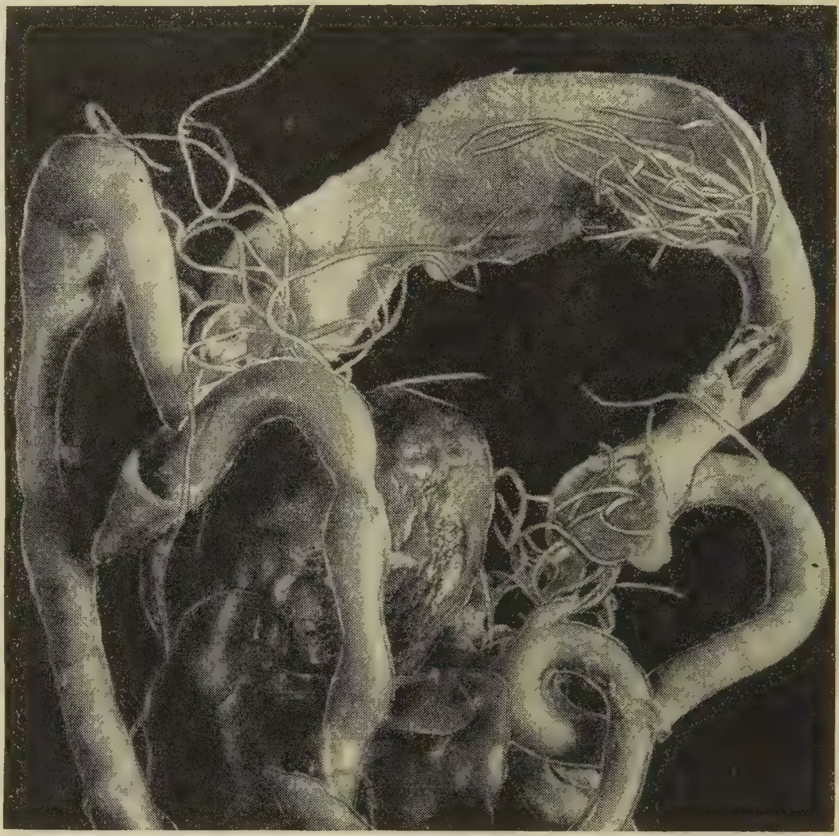
What Worms Are Like and Where They Live

Large roundworms are from 2in. to 4in. long and whitish. They live in the small intestine and are to be found floating free in the material passing through the intestine. If a householder loses a pullet, it is a good practice to open up the bird and with a pair of scissors cut along the length of the first part of the intestine. If worms are present, even in small numbers, they are easily recognised and the remainder of the healthy birds can be treated to ensure that the parasites do not increase.

When birds become heavily infested a few of the worms may be easily seen and identified in the droppings.

Symptoms of Worm Infestation

Worms living in the intestines feed on the material found there and consequently rob the bird of a portion of the nutrients awaiting assimilation. If only a few worms are present, the apparent effect on the bird is negligible, but when a bird carries a heavy worm burden it starts to lose condition, becomes unthrifty, and takes on a dejected appearance with ruffling of the feathers. Pullets infested with worms often develop an anaemic, whitish look in the face before they start to lay. When birds are in lay heavy numbers of worms will cause falling off in egg production.



The intestine of a fowl cut open to show a heavy infestation of roundworms.

Control of Worms

At this time of the year many householders are just getting or have already housed new season's pullets that are usually purchased from commercial poultry producers. Many of the latter adopt a policy of dosing their growing pullets at about 10 to 12 weeks of age or just before they are put into the laying houses. Thus householders may buy pullets that have already been dosed for worms and no further treatment is usually necessary. If, however, new pullets have not already been dosed, householders are advised to dose them soon after they arrive on their premises. No harm will be done if they are dosed twice, but if they have not already been dosed, any possible worm menace is avoided.

There are a number of methods of treating birds for roundworms, but the easiest and most efficient for the household poultry keeper with a few birds is the use of carbon tetrachloride capsules. The gelatine capsules contain either 1 c.c. or 2 c.c. of carbon tetrachloride, but the householder will find the smaller, 1 c.c. capsule easier to administer. By administering capsules to every bird individually the owner knows that each bird has been dosed and moreover has received a full dose. When drugs are fed in mash or added to water, birds obtain varying doses and very often the heavily infested and sick bird takes the least mash or water.

To administer a capsule open the mouth of the bird, place the capsule well toward the back, and close the beak. With a thumb or finger gently massage the throat at the top of the neck until the capsule is swallowed or passes down the food tube. Birds under 18 weeks of age should be given one capsule (1 c.c.) and older birds two capsules (1 c.c. x 2). Normally one dosing will be sufficient for the laying year. Young birds and laying pullets are most easily injured by worms. Hens show some resistance to them.

A worm burden lowers the constitution and condition of birds and makes them prone to other troubles.

Method Used in Dairy Cattle Sire Survey

Farmers inspecting bulls at the New Zealand Dairy Board's Artificial Breeding Centre at Newstead.

By A. T. G. McARTHUR,
Technical Officer, Herd Improvement Department,
New Zealand Dairy Board

THAT the best way of evaluating a dairy bull is to examine the performance of his daughters has been recognised in New Zealand for many years. It is important to know the breeding value of a bull because any individual bull is a parent to far more replacement stock than any individual cow, particularly in artificial breeding. As butterfat production is a characteristic exhibited only in the female, indirect methods have to be used for measuring bull value. This makes breeding for fat production more complicated than selection for something like fast growth-rate in beef cattle, a character exhibited by both males and females. The growth-rate of bulls can be measured by direct means (weighing them regularly from birth to maturity) and, as there is a strong relationship between the growth-rate of a bull and the growth-rate of his offspring, selection for this characteristic is relatively simple. On the other hand by progeny testing for fat production (referred to as sire survey in New Zealand) a dairy bull is indirectly evaluated on the performance of a sample of his daughters. This information can be used to decide whether to breed more daughters from him and to use his sons or to dispose of him.

THE first principle in sire survey is that all available daughters must be included if a true picture of a bull's performance is to be obtained; in other words, there must be no selection of daughters, and the "duds" as well as the outstanding offspring must be included. In the past, breed societies have given their hallmark of merit to bulls which have a selected number of high-producing daughters. This often means that if a bull has a large number of daughters, enough good ones can be found which will have the necessary qualifications, especially if they are given special treatment. If a breed society gives its hallmark to bulls selected on this basis, it will honour above-average, average, and below-average bulls.

Absolute Daughter Production

The straight average of the production of all a bull's daughters is known as the absolute daughter production. However, this is not a reliable guide to a bull's value even when no selection of records is allowed. Bull A may have daughters which average 350lb. of fat and bull B may have daughters which average 300lb. of fat. Is the 50lb. of fat apparent superiority of bull A above bull B due solely to bull A being better than bull B? This will be true only under very limited circumstances:—

1. **If the daughters of both bulls were milked in the same herds in the same years.** Further, it would be necessary that neither bull's daughters got preferential treatment. In practice, of course, this seldom happens. Bull A is likely to be in one herd and bull B in another, and if the farmer who milks daughters of bull A is a better feeder and manager than the farmer who milks

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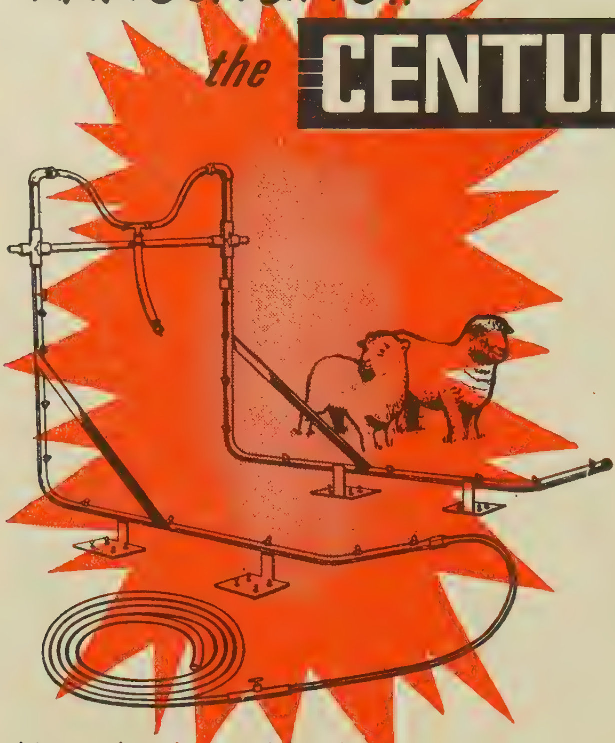

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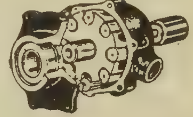

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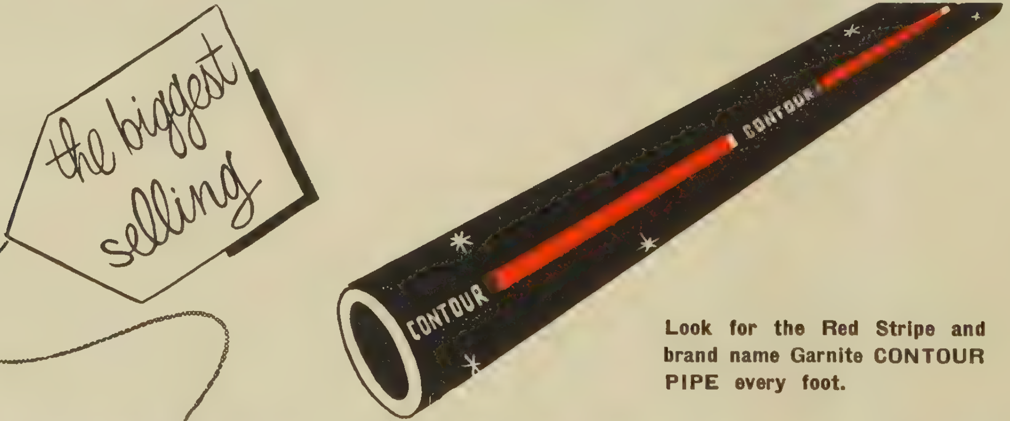

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those of bull B, all of the 50lb. of fat difference between the two bulls could well be due to better feeding and management.

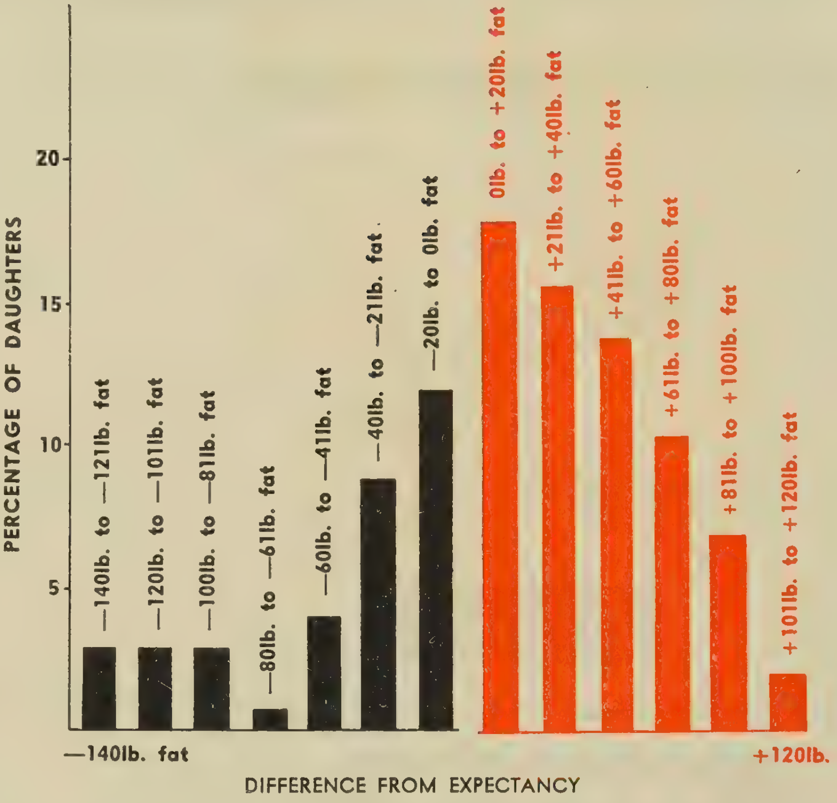
2. **If the bulls were mated to cows of the same breeding value.** Obviously if the daughters of bull A are out of better cows than those of bull B, at least some of the 50lb. of fat difference between them may be due to the breeding value of the dams.

3. **The third stipulation is that both have a very large number of daughters.** It has already been pointed out that an individual bull will produce some very good daughters and some "duds". The wide variation among the daughters of a bull is illustrated in Fig. 1 by 150 daughters of a bull used in artificial breeding.

If bull A and bull B had only two daughters each, the difference of 50lb. of fat between them could be fortuitous, bull A being represented by two daughters which by chance were better than his average get and bull B being represented by two below-average daughters. Of course, as the number of daughters for each bull increases, chance is likely to play a smaller and smaller part. The more daughters there are in a survey the more reliable it is likely to be.

METHOD USED IN DAIRY CATTLE SIRE SURVEY

Fig. 1—The Variation among a Bull's Daughters (150 A.B. Daughters of an A.B. Bull)

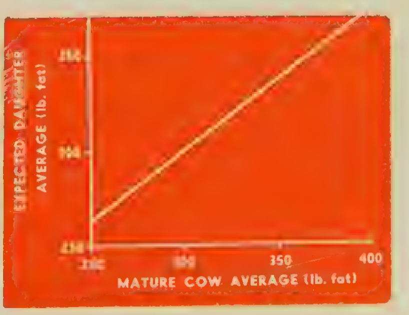


These three stipulations illustrate the weakness of using the absolute daughter production records to evaluate a bull. Daughters of bulls sired by natural mating tend to be bred and milked in one herd and therefore subject to the feeding and management (environmental) level of that herd. To a smaller extent they are also influenced by the breeding value of the dams in that herd. Further, surveys involving only a few daughters will be less reliable than those involving a large number of daughters.

The Herd Improvement Department of the Dairy Board allows for these factors in its sire survey work. To allow mainly for the environmental level of the herd and also for the breeding value of the dams, the sire survey method takes into account the level of fat production in the herd in which the bull's daughters are milked by using the herd's mature cow average. This is the average production of all cows 4 to 9 years of age in the herd, excluding any of the daughters, of the bull being surveyed. From an analysis of surveys previously made the production (corrected to maturity equivalent) to be expected from daughters of the average bull at various levels of mature cow production has been calculated. The daughter average of the bull is compared with this expected daughter average to obtain the difference from expectancy figure.

In Fig. 2 the values for expected daughter averages have been plotted against a range in mature cow averages from 250lb. to 400lb. of fat. The average bull used in high-producing herds has an expected daughter average below the mature cow average, and the reverse is true in low-producing herds. If a direct comparison were made between the daughter average and the mature cow average without using the expected daughter average, bulls in high-producing herds would be penalised and bulls in low-producing herds would be given an unjust advantage.

Fig. 2—The Expected Daughter Average of Bulls Used in Herds of Varying Mature Cow Average



Using this method of "difference from expectancy" it is possible to compare bulls which had been surveyed in herds with different mature cow averages. In general the same bull obtains the same difference from expectancy at all herd levels. This has been established from the records of 214 bulls which have been surveyed in more than one herd. The results are shown in Table 1.

TABLE I—BULLS SURVEYED IN TWO HERDS

	High herds	Low herds
Number of sires	214	214
Daughter average	358	308
Mature cow average ..	369	300
Difference from expectancy	+5	+6

The bull's daughter level varied according to the level of the herds in which they were used, but as can be seen from the table the difference from expectancy figure in general remained constant. Therefore a bull that is +20lb. of fat in a herd where the mature cow average is 400lb. of fat is likely to be just as good as one which is +20lb. of fat when used in a

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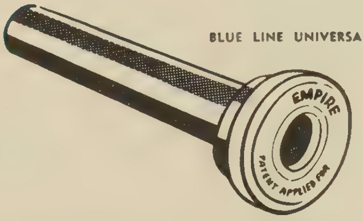
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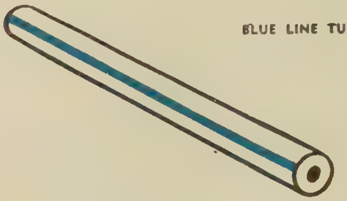
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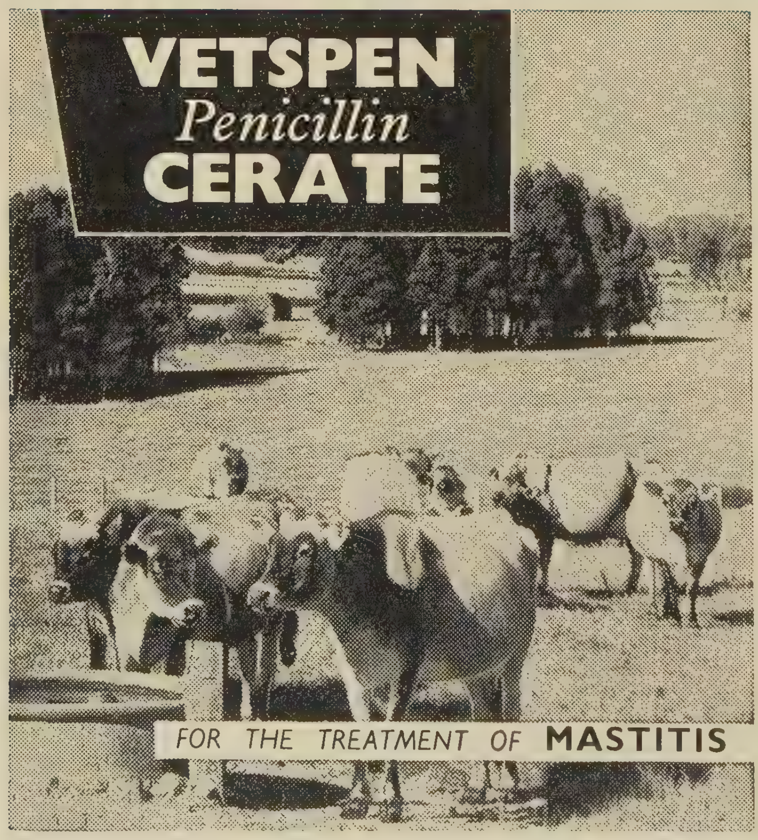
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herd averaging 250lb. of fat for the mature cows.

Chance Factor

The difference from expectancy method takes into account the herd environmental level problem and the breeding value of dams. The Herd Improvement Department has also designed a method to deal with the chance factor which may make a bull look better, or worse, than he really is.

It has already been pointed out that a small number of daughters in a sire survey can be very misleading. A bull whose survey includes a large number of daughters is more reliably proven than one with relatively few daughters. One would obviously prefer a bull with 50 daughters to one with 5 daughters if both had the same difference from expectancy figure. The performance of future daughters of the 50-daughter bull can be predicted with much more certainty than can that of the 5-daughter bull. To take another example: If the first daughter a bull leaves produces 450lb. of fat as a 2-year-old, his next 10 daughters would be unlikely to do so well and no one could be dogmatic about the bull's value until more daughters had been milked. When 20 daughters' records were available, however, a more confident opinion could be given.

Using a similar approach, but putting the subject in more rational terms, the Herd Improvement Department has designed a series of adjustment factors which scale down the difference from expectancy figure according to the number of daughters and lactations in a survey. These factors are shown in Table 2. Adjustment factors are multiplied by difference from expectancy, so a +20lb. of fat bull with 6 daughters and 6 lactations would become +20lb. of fat × 0.30 = +6lb. of fat. Adjustment factors scale back surveys containing relatively few daughters more severely than surveys involving a large number.

TABLE 2—ADJUSTMENT FACTORS FOR CALCULATION OF SIRE'S RATING

No. of daughters	No. of lactations	Factor
6	6	0.30
6	9	0.33
7	7	0.33
8	8	0.35
10	10	0.39
10	16	0.44
15	15	0.47
15	25	0.52
20	20	0.51
20	45	0.60
30	30	0.57
30	60	0.66
40	40	0.60
40	90	0.71
60	105	0.75

The difference from expectancy figure adjusted for the number of daughters and lactations in the survey is called "rating". With the use of this rating figure a choice can be made between bulls with various numbers of daughters. For instance, which is the best bull? A +50lb. of fat sire with 20 daughters with one lactation each or a +60lb. of fat sire with 10 daughters with one lactation each? The rating of the first bull is +25lb. of fat (+50lb. of fat × 0.51) and the rating of the second is +23lb. of fat (+60lb. of fat × 0.39), so that the first bull is likely to be better.

Of course, adjusting factors not only scale down bulls with plus differences from expectancy, but scale up bulls with minus differences from expectancy, so that a bull that is —50lb. of fat with 20 daughters would have a rating of —25lb. of fat. This rating figure is also being used to determine whether a bull qualifies as a merit sire. Merit sires are bulls with a rating of +10 or better and are, on their survey results, the top 25 per cent. of all bulls surveyed.

Not Wide Variation in Bulls

It is not intended in this article to discuss how the adjustment factors were arrived at, but additional details will give the reader an idea of how they operate. The true variation between bulls (as measured by their daughter performance) is not as wide as many imagine. There are very few bulls which will be genuinely capable of lifting production by more than 40lb. of fat and very few that will lower it by more than 40lb.

This agrees with experience in artificial breeding. The best bull used so far at the Dairy Board's Artificial Breeding Centre at Newstead is +36lb. of fat above expectancy on several hundred A.B. daughters. However, from the sire survey register one can pick out bulls with differences from expectancy of as much as 100lb. of fat, but these bulls generally have only a small number of daughters. Such bulls are probably outstanding animals, but they will not be as good as they appear, because some of their apparent superiority will be fortuitous (they have been surveyed on an above-average sample of their daughters). Because fortuitous results are less likely to occur when the survey contains a large number of daughters, the variation between surveys decreases as the number of daughters in the survey increases. Hence, the adjustment factors become less severe the more daughters there are.

Working through an example (shown in Table 3) will show how a sire survey is calculated: The first step is to calculate the mature equivalent production of the bull's daughters by adding 70lb. of fat to 2-year-old records and 35lb. of fat to 3-year-old records. (Judy's abnormal lactation has been omitted.) The average for the 10 lactations is 320lb. of fat. The average for the mature cows is obtained by weighing the averages for each season by the number of lactations in each particular season. This gives an overall mature cow average of 310lb. of fat.

The expected daughter average for the average bull used in herds where the mature cow average is 310lb. of fat is 309lb. of fat (see Fig. 2). Thus the difference from expectancy is 320lb. — 309lb. = 11lb. of fat.

The next step is to adjust this 11lb. of fat difference from expectancy figure for the number of daughters and lactations in the survey. The adjustment figure for 8 daughters and 10 lactations is 0.37; 11lb. of fat is now multiplied by this figure to give a rating of +4lb. of fat. This means that it is estimated that this bull will, in future, sire daughters that will produce 4lb. of fat more than daughters of the average bull.

In considering the ratings of individual surveys based on a small number of daughters it must be remembered that the rating figure is only an estimate of the real value of the bull. Only when a bull has a fairly large number of daughters (say 50 or more) does the rating give an accurate picture of a bull's real value; so rating is only an estimate of the bull's value unless it is based on a very large number of daughters. For instance, a bull that is +100lb. of fat from expectancy on 6 daughters has a rating +30lb. of fat. If a line of such bulls with 6 daughters each is selected, it can be expected with some confidence that their average rating will be +30lb. of fat when all their daughters come into milk. But, of course, individual bulls will vary

TABLE 3—NATURAL PROOF BASED ON 8 DAUGHTERS IN ONE HERD (2 SEASONS' RECORDS)

Daughters				Mature cows
Name	Age years	Fat (actual) lb.	Fat (mature equivalent)	Average fat lb.
1st season				
Ada	2	250	320	298
Judy	2	270	340	298
Sara	2	220	290	298
2nd season				
Ada	3	310	345	315
Judy	3	120	[Died from bloat]	
Sara	3	280	315	315
Flora	2	274	344	315
Dora	2	244	314	315
Agnes	2	199	269	315
Julie	2	265	335	315
Blush	2	257	327	315
Totals (8 daughters, 10 lactations)			3,199	3,099
Average of 10 lactations			320	310
Expected daughter average			309	
Difference from expectancy			+11	
Sire's rating (+11 × 0.37)			+4	

considerably; some will come out better than +30 in the final analysis while others will be lower than +30. This variation is inherent in progeny testing because merely a few of the possible daughters of a bull are sampled and because of the wide variation among them.

Primary Aim of Sire Survey

The primary aim of sire survey is to give a guide to the breeding value of bulls used in the industry. In practice the individual owner of the bull is the person best qualified to weigh up the bull's merits, because there are many environmental factors which may influence the results that are difficult to assess from merely studying the data in an office. For instance, age-correction factors are used in sire survey work; these are accurate for the average tested cow in New Zealand, but they are less accurate when applied to heifers and 3-year-olds in individual herds. Work at Ruakura Animal Research Station and elsewhere has shown the effect that plane of rearing has on production in a cow's first two lactations, so that if a line of heifers by one bull enters the herd in very much better than average condition, the bull may appear better than he really is.

In circumstances which result in the daughters of a particular bull receiving preferential treatment (such as would occur where they are run separately from the herd or receive additional concentrate feeding over and above that given to the rest of the herd) the difference from expectancy figure and its derivative rating will not be of any value as a guide to the bull's breeding ability. To give another example: The daughters of a particular bull may calve early in relation to the mature cows in the herd and consequently have a longer lactation. This could give a plus figure which is not due to the bull being above average.

Farmers are therefore strongly recommended to check these points by visiting the farm where the bull has been surveyed before considering buying him.

Bulls Used in A.B.

When a bull is used in artificial breeding his daughters become spread through many herds and so environmental factors which tend to favour the daughters of a bull in one herd will be counterbalanced by environmental factors which tend to penalise other daughters of the same bull in other herds. Therefore, the sire survey results of bulls which have been used in artificial breeding are more accurate than the results from bulls used under natural-service conditions. A slightly different adjustment factor for daughter and lactation number is used for A.B. sire surveys, but otherwise the method of calculation is identical to that used for bulls surveyed in herds using natural mating.

Most of the progeny-tested bulls used in A.B. are selected on the basis of their daughters which have been sired by natural mating. Subsequently these bulls acquire surveys on the basis of their A.B. daughters, so that it is possible to compare their natural service surveys with their A.B. surveys. This has been done in Table 4.

TABLE 4

	Natural proof	A.B. proof
Number of bulls	20	20
Average number of daughters per bull	31	161
Average number of lactations per bull	69	317
Average difference from expectancy	+34lb. fat	+18lb. fat
Rating	+22lb. fat	—

The close agreement between the average rating of the natural proofs of those bulls with the increase in production shown by their A.B. daughters shows the value of the natural proof, even though it is not quite reliable as the A.B. proof. However, it must be remembered that the bulls selected for use at the Dairy Board's Artificial Breeding Centre on the basis of their natural-service proofs have their daughters inspected on the farm by the A.B. Bull Buying Committee. Bulls which may look good on their surveys, but with which environmental factors rather than the ability of the bull have been responsible for the good survey, can be rejected for use in A.B. by investigating the situation more closely on the farm.

Farmers who wish to obtain the same results as those who have selected bulls for the A.B. centre must follow the example of the bull buying committee and make some "on the farm" observations. These, together with the rating figure, will help them come to a reasonable estimate of the bull's real breeding value.

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Book Review

"Robert Bakewell": H. Cecil Pawson

IN his preface the author says: "Robert Bakewell may be regarded as a man whose work assumed an importance which has not been exceeded by any agriculturist before or since his time and it is curious to consider why, if this statement is not an exaggeration, there is no biography of him."

Probably because of the dearth of reliable information this book does not show clearly just how Bakewell produced his new breeds of sheep, cattle, pigs, and horses. It does, however, show clearly what a remarkable man he was. Some 200 years ago he was familiar with and actually practised many of the concepts which are embraced in modern scientific agriculture. In pasture production and management these included the use of ryegrass and white and red clovers as pasture plants; pasture control by close subdivision, adequate stocking, and topping; rotational grazing; and irrigation. "On a farm of 440 acres with 110 acres under the plough he kept 60 horses, 400 large sheep and 50 beasts of all sorts."

With his livestock Bakewell practised progeny testing of bulls and rams, the use of teaser rams and hand mating, the production of beef and mutton carcasses having a conformation which ensured a high percentage of the more expensive cuts, and the breeding of mutton sheep which matured early and produced a high weight of meat per acre. He decried the use of concentrates for preparing stud animals for sale.

He used the following techniques which still find a place in agricultural research stations: the cutting of measured small areas to estimate the weight of hay crops and the effect of irrigation; feeding experiments to measure the relative efficiency of different breeds of sheep in converting grass to meat; carcass dissection to measure distribution of muscle, fat, and bone in meat.

Though on one occasion he had to be rescued from bankruptcy by public subscriptions, he must have been an astute businessman, as he leased rams at fees of several hundred guineas per season and charged up to 10 guineas for service to ewes.

His controversy with another breeder and some of the rules of the breeding society which he founded show that he was not altogether an altruist. Nevertheless, the following assessment by a contemporary does not appear entirely fulsome: "One of these remarkable beings that the Almighty sends into the world now and then to correct, amend and improve us in those various departments in which they apply their great talents."

—*J.F.F.*

Crosby Lockwood & Son, Ltd., London. 25s.

Boiling Offal to Destroy Hydatids before It is Used for Dog Food

By P. L. THOMAS,
lately Scientific Officer, Department of Agriculture Animal Research Station, Wallaceville

THERE has been some doubt about the time for which offal fed to dogs should be boiled to render hydatid cysts non-infective to dogs. Experiments done with a simple oil-burning cooker indicate that 10 minutes at a rolling boil, with a total of about 20 minutes at 100 degrees C. (212 degrees F.), is sufficient. A simple standard procedure for obtaining good results is given in detail in this article.

WITH the growing impetus of publicity campaigns aimed at informing all dog owners, particularly farmers, of their responsibility for keeping dogs free of infection with the hydatid worm (*Echinococcus granulosus*) queries have arisen concerning the degree of cooking to which offal need be subjected to sterilise any hydatid cysts present. To determine this an experiment with dogs has been carried out at the Department of Agriculture's Wallaceville Animal Research Station.

THE following facts were found in literature concerning the survival of the scolices or larval tapeworm heads in the cysts:—

(a) Scolices are killed by freezing or by heating to 50 degrees C. (1).

(b) Raising the temperature to 55 degrees C. for 1 minute will kill all hydatid elements derived from sheep, and boiling for 10 minutes should achieve this effect on deep-seated cysts in liver, etc. (2).

(c) Boiling should be done for 10 minutes (3).

(d) Boiling should be done for 40 minutes (4).

Recommendation (d) is based on the results of work done under the auspices of the Hydatid Research Department of the New Zealand Medical Research Council (5). As far as can be ascertained, however, all of these recommendations have been made on the basis of the heat required to kill the scolices as judged by microscopical examination to detect cessation of movement, failure of the excretory system, and morphological changes, and not on loss of infectivity to dogs.

It seems preferable that ability to infect a dog should be measured when this is the object of the experiment.

Therefore in a small-scale experiment carried out at Wallaceville the criterion in deciding whether scolices have been rendered non-infective has been their failure to develop into mature worms when eaten by a dog.

Details of Experiment

Infected livers were obtained from a Wellington meat works. Adult sheep were the predominant animals killed at the time of the trial (June) and the livers were big and large cysts were frequent.

A 2-gallon bucket of fresh condemned livers was collected on 13, 20, and 27 June 1957 and these were used as food for two dogs, a retriever and a collie. On each of the above dates one liver was fed raw to the retriever. The rest of the livers were cooked, and they together with the gravy produced were then the principal meat portion of the diet of both dogs during the week after cooking.

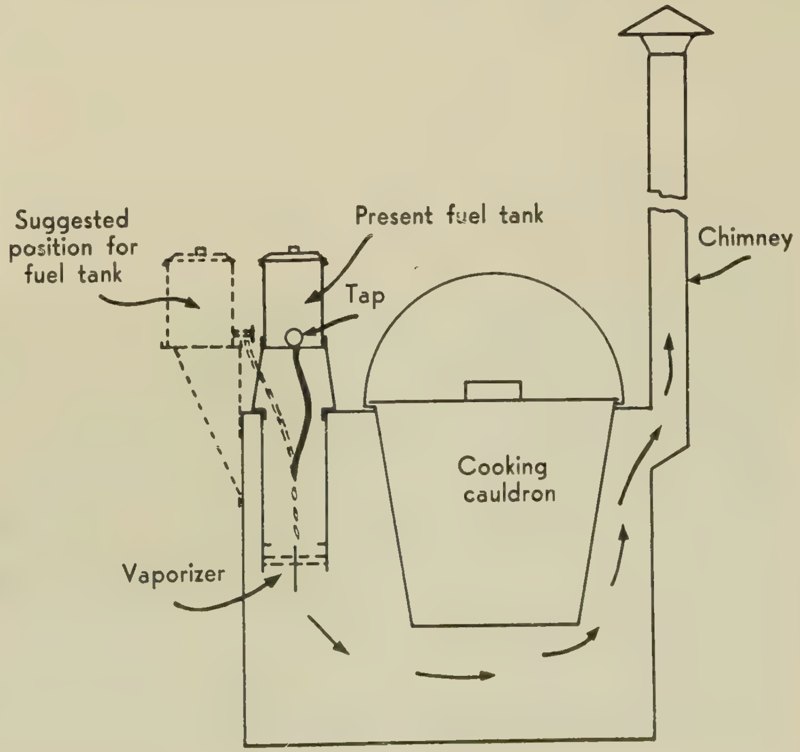
Cooking

The following was the standard cooking procedure: 1 gallon of water was put into the copper and brought to a rolling boil. The 2-gallon bucket of livers was then emptied in. The water was then brought back to a rolling boil and maintained in this state for 10 minutes, after which the oil feed to the fire was turned off. The heat of the copper was such that the contents continued to boil for 2 minutes and to simmer for a further 3 minutes. The copper was then left to cool, the excess water was strained off, and the livers and gravy were used for food.

Fuel

The cooker used was a commercial one specifically designed for cooking offal and its construction is shown in the diagram on this page. It used fuel oil, though wood or a mixture of wood and oil firing could be used.

The time and the fuel required for the standard cooking procedure using oil firing alone were measured. To bring 1 gallon of water to the boil took 25 to 35 minutes. The time to bring it back to a rolling boil after the livers were added was 5 minutes on each



occasion. The rolling boil was maintained for 10 minutes. The boiling plus simmering time after the fuel was turned off was 5 minutes.

The fuel consumption in each case was about 1½ pints, the copper being used out-of-doors under cool conditions.

In spite of the fact that the time to bring the water to the boil varied, it was apparent that this was closely related to the speed of flow of the fuel and that an equal amount of fuel would apparently give the same result, regardless of the speed with which it was fed to the fire, within the limits at which proper combustion is obtained. (If the flow is too slow, the vaporizing plates cool and a smoky flame results; if it is too fast, there is again incomplete combustion and clouds of smoke come from the chimney.)

The Dogs

The dogs, a collie and a retriever, were both well grown and had been kept in Wellington City and it was unlikely that they had been exposed to infection with the hydatid tapeworm. Faeces samples from both dogs did not contain tapeworm eggs. (All tapeworm eggs commonly found in dogs are similar and it is not possible to identify the type of tapeworm present, so a negative finding was essential.)

As a further precaution both dogs were purged with arecoline hydrobromide before the experiment proper was started. No *Echinococcus* were expelled, and it can be assumed that at the beginning of the experiment both dogs were free from infection.

Both dogs were treated alike except that the retriever was fed three raw livers with hydatid cysts present in addition to the cooked meat, and the collie had only cooked meat.

The Hydatid Worm

In New Zealand *Echinococcus granulosus*, the hydatid tapeworm, is found only in dogs. Dogs therefore are the only source of infection which can lead to the cyst stage developing in sheep, cattle, pigs, or man, and dogs can become infested only by eating such cysts raw.

The worm is very small, of about the size and shape of the cross stroke of the "A" in Agriculture on the front cover of this journal. It takes 47 to 51 days from the time the cyst is eaten for these worms to mature and be able to pass eggs. Until this stage is reached, when the worms become white owing to the eggs inside the segments, they are translucent and difficult to detect.

For this reason the dogs were not killed and examined until 62 days after infected offal was first fed (and 48 days after it was last fed).

Result

The post-mortem examination showed that the retriever which had eaten three raw livers was heavily infested, but the collie, which had only cooked livers, was completely free from infection.

Satisfactory and Easy Procedure

From the results of this limited experiment it appears that even cysts in large uncut sheep livers are rendered innocuous if they are treated in the manner described. Equally good results could be expected with lung, which is a less dense tissue, or with a heart, which is smaller. The occurrence of cysts in the tissue of the alimentary tract (food passage through the body) is comparatively rare. If it is fed to dogs, similar treatment should be effective.

Offal from cattle is far less frequently fed to farm dogs than that from sheep, but if home killing of cattle is done, it may be necessary to chop up this larger offal before it is cooked.

What is probably more important is the fact that the use of a stove of the type described makes possible an easy routine to deal with offal. In the operations described about 1½ pints of fuel were consumed with very little variation on each occasion. The tank had a "dead fuel" capacity (fuel left in the tank after flow had ceased from the outlet pipe) of just under ½ pint.

Complete cooking of sufficient offal to fill a 2-gallon bucket, in 1 gallon of water, would therefore be certain if the fuel tank were arranged to hold 2 pints of fuel when full and was filled each time before ignition.

The procedure would then be as follows:—

1. Fill the fuel tank.
2. Pour 1 gallon of water into the copper.
3. Light.
4. Kill sheep and place offal (up to a maximum of a 2-gallon bucketful) in the copper. (There is at least 25 minutes for this before the water boils.)
5. The cooker may then be left. The fire will go out after consuming enough fuel to give the desired result.

Fuel requirements would obviously vary with different designs of cooker, but could easily be worked out with a few practical trials.

The cooker used in this trial was easily managed and was used out of doors during winter without any trouble. The only criticism of it was the position of the fuel tank, which was directly over the vaporizer. During lighting, flames frequently enveloped the tank. Though it has not yet caught fire or caused an injury, Wallaceville staff have always retired to a safe distance at this stage until the conflagration died down. As soon as the draught began to function and drew the flames into the body of the cooker one could be certain that the boiler would function properly.

This weakness would be overcome if the fuel tank were placed to one side of the vaporizer as suggested in the diagram on page 271.

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Tractor Drivers—

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New Type of Electric Fence

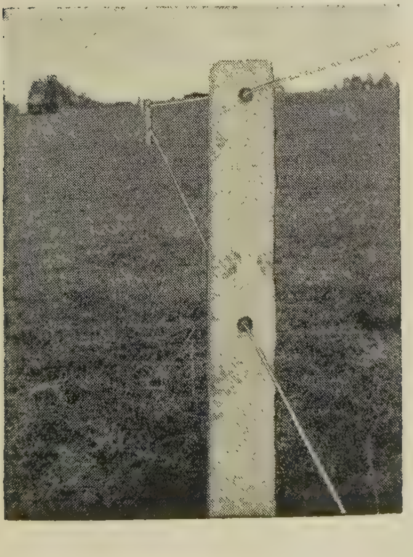
By A. V. ALLO,
Instructor in Agriculture,
Department of Agriculture,
Tauranga

OVER the past few years increasing attention has been paid to the subdivision of dairy farms. There is much evidence that on many dairy farms paddocks are far too large to allow efficient use of pasture and that the better the pastures are the smaller paddocks should be. In general, the ultimate objective should be paddocks of an area sufficient to graze about 20 to 30 cows per acre, depending on the class of country.

THE major opposition to any scheme of subdivision is based on the cost of fencing. Admittedly, if a 5-wire fence is to be used, costs are high, but fortunately alternatives are available, based on the use of the electric fence. On most farms where the electric fence is used the electrified wire is supported by steel standards of varying shapes and sizes, or, less frequently, by wooden stakes. Nearly all these fences have the serious weakness that lack of permanency and lack of resilience make them very vulnerable to charging stock. Thus, for a long time, there has been a demand for some type of fence that is cheap, permanent, and easily erected.

A Paengaroa farmer, Mr. C. N. Martin, has recently designed a type of fence that embodies these principles and that offers great possibilities for those wishing to reduce the size of their dairy paddocks. The method of fencing devised by Mr. Martin is simple, consisting of a combination of concrete posts and electric fence.

Fig. 1.



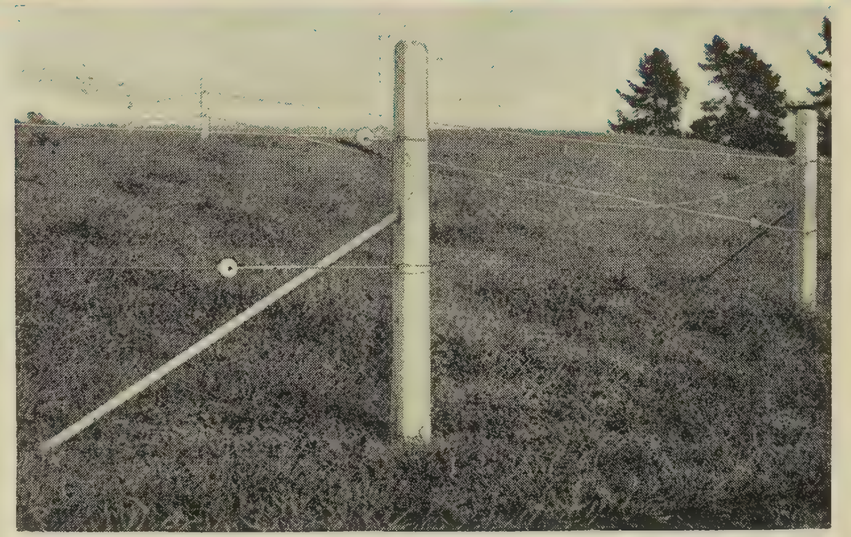


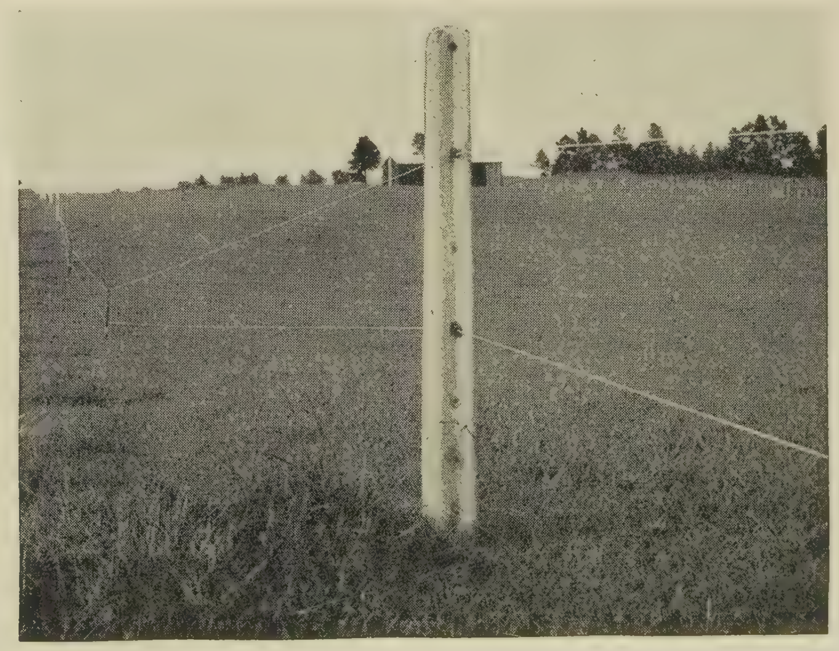
Fig. 2.

When the electric fence is used on the standard type of post, whether concrete or timber, the weakness is that insulators can easily be knocked off, making the fence ineffective.

Mr. Martin has overcome this difficulty by running the electrified wire directly through the post. While the post is being made two lengths of ½in. plastic tubing are placed in the mould, each piece being crimped in the centre by a special appliance so that the tubing cannot be removed once the concrete has set (see Fig. 1).

The erection of the fence is simplicity itself. A concrete post is used as a strainer, being stayed with a 5ft. length of ¾in. galvanised piping (see Fig. 2). Two No. 8 gauge galvanised wires are used on the fence, being fastened to the strainer with the type of porcelain insulator that takes a strain (see Fig. 2). These wires are then threaded through the posts along the fenceline, the posts being placed one chain apart. Tie-downs, with insulators, can be used in the hollows when the fenceline is run out along undulating country (see Fig. 3, which also shows the type of post being used).

Fig. 3.



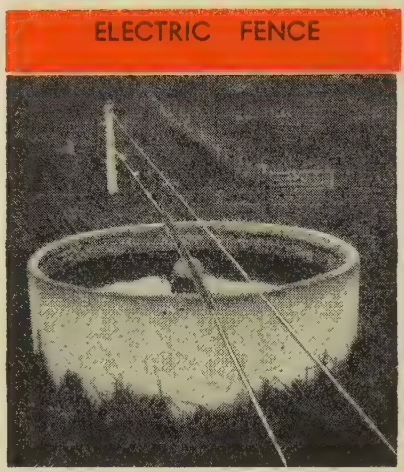


Fig. 4.

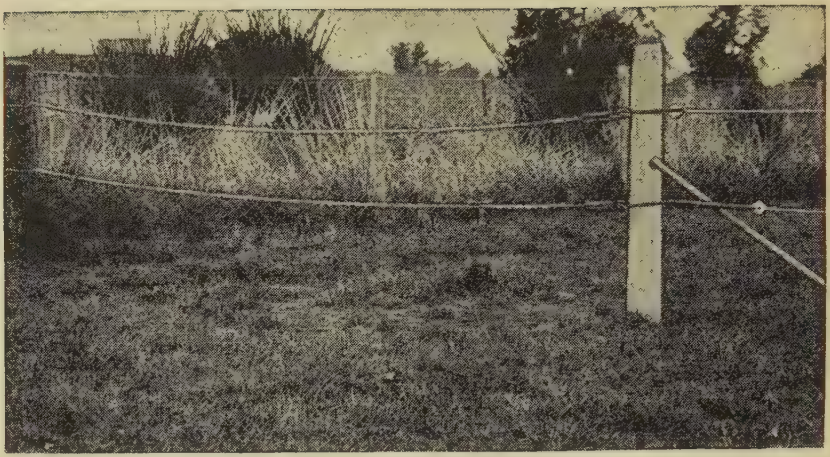


Fig. 5.

The great advantage of this type of fence is its resilience. When a beast tries to break through it the wires will give, so that the animal is being given a continuous series of shocks, without the fenceline collapsing. In practice, an animal usually tries to get past the fence only once.

Many farmers when subdividing an existing paddock use the trough already present to water the two new paddocks by running the fence over the trough. In the past this has been difficult when an electric fence has been used. This problem can be overcome by threading the lower fence wire through a length of plastic pipe where it crosses the trough (see Fig. 4). Gateways into the paddock are also simple and efficient, being merely two lengths of galvanised chain, through which the current is carried. Rubber handgrips can be used for opening and shutting (see Fig. 5).

This type of fence can be erected for £90 a mile for materials. This figure compares very favourably with the costs of other types of fence, and the durability and neatness of the finished fence make it worth consideration by any dairy farmer who is contemplating subdivision.

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Aerial Seeding and Topdressing of North Island Hill Country

BEFORE North Island hill country is topdressed from the air, the pasture should be carefully examined for presence of clover. On dry hills white clover and subterranean clover should be present and on wet or shady faces white clover and *Lotus uliginosus (major)*. If these are not present in sufficient amounts, they should be sown, the subterranean clover at 3lb. per acre, the white clover at 2lb. per acre, and the *Lotus uliginosus* at 1lb. per acre. Before sowing the pasture should be closely grazed. In wet seasons when the growth cannot be controlled oversowing is not recommended.

After oversowing paddocks should be closed from stock to permit establishment and this should be followed by light grazing or by using only cattle until next summer to allow the newly established species to seed and increase. Establishment from oversowing is generally fairly sparse even under good conditions and natural reseeding should be used as much as possible in subsequent seasons to produce a thick sole of the introduced clovers.

Oversowing with grasses generally fails and is not worth while attempting except where a burn is being resown. Recent research, as described in the article on page 227, has shown that oversowing grasses can be carried out successfully with the aid of chemicals.

The clover seed can be sown mixed with fertiliser, the choice of which is determined by soil requirements. On much of the harder or more clayey textured hill country, except that derived from limestone, the soil is deficient in molybdenum, and molybdenised superphosphate or molybdenised serpentine superphosphate should be used. On other soils serpentine superphosphate can be used. Serpentine superphosphate is preferred by aerial topdressing operators because it flows freely and stores well.

—*J. E. BELL,*
Fields Superintendent,
Department of Agriculture,
Auckland

◆◆

Vacancies for Extension Workers

There are a number of vacancies for Instructors in Agriculture, Fields Instructors, and Soil Conservators in the Extension Division of the Department of Agriculture.

Though the general requirement for these positions is a degree in agriculture and experience in farming in New Zealand conditions, applications from those holding a diploma in agriculture and having a good farming background will be considered.

All recruits to the extension service receive training before being required to undertake farm advisory work, and for the first year or two carry out very interesting work such as field experiments, seed certification, and farm surveys; Soil Conservators learn the principles of soil conservation by doing field work on catchment control schemes and contour furrowing operations and carrying out general duties on soil conservation reserves.

Further details about these vacancies can be obtained from the nearest office of the Department of Agriculture.

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A. and P. Show Dates

THE following are dates and venues of A. and P. shows up to the end of April:—

NORTH ISLAND

March

22 March—Poverty Bay Autumn Carnival at Gisborne.

SOUTH ISLAND

March

22 March—Mayfield A. and P. at Mayfield.
*29 March—Methven A. and P. at Methven.

April

7 April—Strath Taieri A. and P. at Middlemarch.
7 April—Mackenzie County Highland Show at Fairlie.
12 April—Oxford A. and P. at Oxford.
*19 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.

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Meat Production per Acre under Various Stocking Systems

Ewes and lambs on the area stocked at the 8 ewes per acre rate in the first phase of the experiments. In the second phase the 6 and 8 ewes per acre farms were replaced by straight beef-producing units.

By C. P. McMEEKAN,
Superintendent, Department of Agriculture's Ruakura Animal Research Station, Hamilton

FOR a number of years the Ruakura Animal Research Station has been studying the efficiency of meat production per animal and per acre under different systems of farming. The study is designed ultimately to cover all the major variations normally possible in the ratio of sheep to cattle and in the type of cattle used. During the first 4 years three systems were studied. In one system, typical of that in most fat lamb country of the North Island, 4 breeding ewes were run per acre plus cattle wintered. The second system had a higher stocking rate of 6 breeding ewes per acre plus cattle bought in spring and fattened. In the third system 8 breeding ewes per acre were run without cattle. This first stage of the study was designed to answer two main questions: First, how meat production is affected by the ratio of sheep to cattle, and secondly, what disadvantages, if any, to stock health are associated with an all-sheep policy. This article, an adaptation of a paper presented at the Ruakura Farmers' Conference Week in 1957, discusses the second stage of the study, but first a summary of the information derived from the first stage is given.

IN the first 4 years the farms with 4, 6. and 8 ewes per acre taught six main lessons, which are listed below with a brief discussion on their significance to sheep farming.

FIRST PHASE OF EXPERIMENT

Production Target

The study set a production target for the North Island meat producer. It showed that an output of 250lb. of dressed meat per acre is a reasonable expectation from a well-managed meat-producing farm on average fattening country farmed under a grassland system. This finding could be of very great importance to New Zealand, since by setting an attainable target well above the present average level of productivity, it could start a production drive with profound effects on the country's economy.

Thirty years ago the development of a comparable target for the dairy industry had this effect. E. J. Fawcett's demonstration that a yield of 200lb. of butterfat per acre was a reasonable expectation from a North Island grassland dairy farm so fired the imagination of extension workers and progressive farmers that very many dairymen today have not only attained but surpassed this level of efficiency.

The Economic Service of the Meat and Wool Boards indicates that the average level of productivity from North Island meat-producing farms is only a little better than one-half the 250lb. of meat suggested as practicable. The author is confident that if advisory services and progressive farmers would accept this finding and act on it a very material increase in average productivity of fattening farms would result.

Sheep to Cattle Ratio

The second important outcome of the study was the demonstration that this

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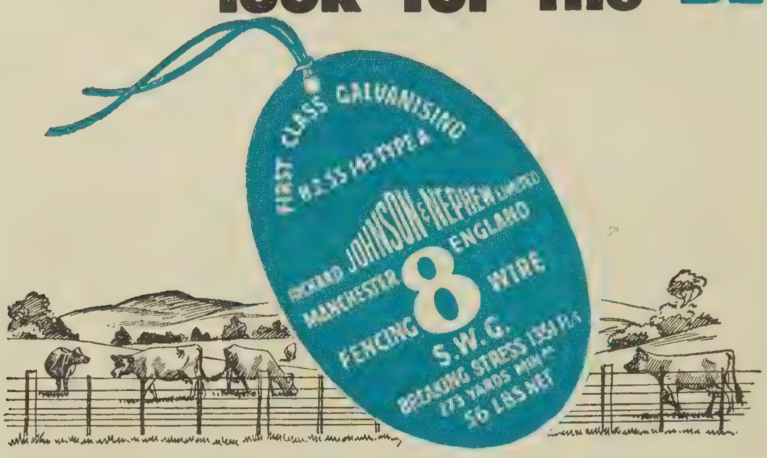
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The meat production per acre project at Ruakura has attracted a great deal of attention at recent annual Farmers' Conference Weeks at the Station. Here during the field day at a conference Dr. C. P. McMeekan, Superintendent of the Station, discusses with farmers the layouts of the experimental farms and the results of the experiments.

output of meat is not affected by the ratio of sheep to cattle. Approximately the same yield was obtained from the three farming systems. This finding is important because it shows that to achieve over-all efficiency in the utilisation of grassland for meat production the farmer has a wide choice of sheep to cattle ratios without affecting the productive level of his farm. Such flexibility is important economically.

Lamb Production

Though meat per acre was not affected by the sheep to cattle ratio, the study showed conclusively that the amount of lamb meat that can be produced from each acre of grassland is directly dependent on the number of breeding ewes carried. At 8 ewes per acre the output of lamb meat was 80 per cent. greater that at 4 ewes per acre. Six ewes per acre yielded 50 per cent. more fat lamb meat than did 4 ewes. Weight per lamb, however, declined with increasing stocking rate, so that the average lamb weights were lowest on the 8 ewes per acre farm and intermediate on the 6 ewes per acre. Actual differences were: 4 ewes, 34.5lb.; 6 ewes, 33.3lb.; and 8 ewes, 31.6lb.

If maximum output of lamb meat is the objective, a high stocking rate of breeding ewes is essential. Fortunately, this requirement also results in lambs conforming to the present demand for lighter carcasses. Farmers, therefore, can achieve both a greater output of lamb meat and lambs of weights nearer the commercial ideals of today by the simple expedient of increasing the number of ewes carried.

Wool Production

No reference to meat production in New Zealand can ignore wool, which contributes so substantially toward the cost of producing both lamb and beef. The study showed that the yield of wool per acre, like the yield of lamb, was closely related to the number of ewes carried. Despite a lower clip per ewe, 42 per cent. more wool was produced on the 6 ewes per acre farm than on the farm with 4 ewes per acre, and 80 per cent. more was obtained from the unit with the highest carrying capacity.

Quality of wool was slightly affected. Finer wool was produced under the higher stocking rates, but the percentage of cotted fleeces and fleeces with break was greater. These defects, however, did not reduce the price per pound, which was highest for the finest wools produced under the 8 ewes per acre system. The gross cash return of wool per acre was thus substantially greater on the higher-stocked units. The lesson to the meat producer is obvious.

Health of Sheep

Of special interest were possible effects on the health of sheep run at such widely different stocking rates. Traditionally, sheepmen have believed that country can get sheepsick; that troubles from internal parasites increase; and that over-all health problems are greater when sheep are carried at a high rate per acre, especially when only sheep are run. Though the study ran for only 4 years, it is more than interesting that there was no difference in ewe deaths, there was no difference in lambing percentage, there was no difference in lambing losses, and the worm burden carried by the lambs at slaughter was identical under the three stocking rates. No trouble was experienced from worms and no drenching of either ewes or lambs was found necessary under the three systems. These points are worth remembering if only

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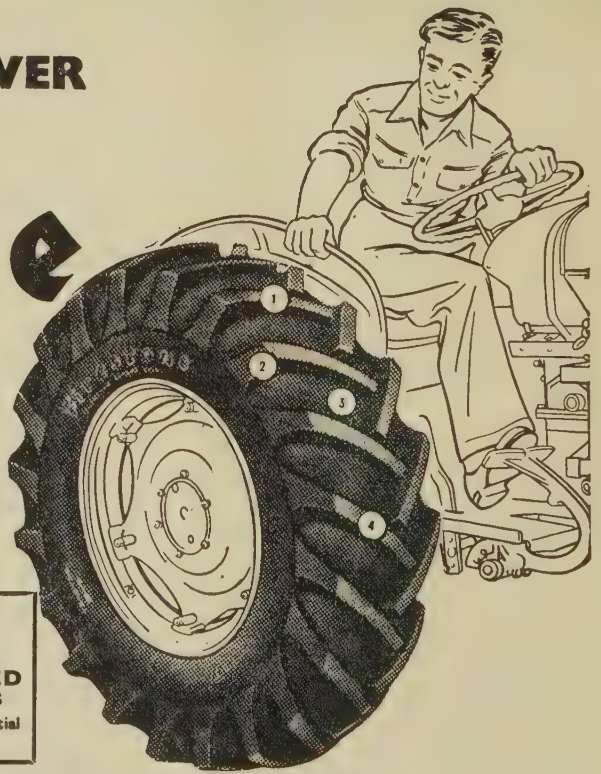

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to remove the fears of some sheepmen about possible hazards of heavy stocking with sheep.

Beef Production Factor

The study high lighted the contribution of cattle to productive efficiency. The results showed quite clearly that if the grass produced on a well-managed grassland fattening farm is fully utilised, the lower output of lamb meat from a low sheep stocking rate can be made up by a compensating output of beef. Both on the 4 ewes per acre and on the 6 ewes per acre units the beef produced was sufficient to bring the total meat output to the same level as that obtained from lamb alone on the 8 ewes per acre farm. Unfortunately, since beef meat on the average is worth only half the value of lamb meat to its producer, gains from the cattle run were relatively less profitable. This finding is very significant both to the individual farmer and to the country as a whole because it means that the profitability of meat production is closely related to a high ratio of sheep to cattle.

SECOND PHASE

In the second phase of the study the 4 ewes per acre unit has been managed in the same way as during the first 4 years. As the "standard" system this unit is a connecting link between the two stages of the study and enables reasonable comparisons to be made between the results of the first series and the results of the present series. The 6 ewes per acre and 8 ewes per acre farms were replaced by straight beef-producing units. On one the objective was the production of chiller beef from a herd of Aberdeen Angus breeding cows maintained on the area. The other has been a straight fattening farm on which the object has been maximum output of beef per acre with bought store cattle as the material.

Beef Production

In this study there has been especial interest in the relative efficiency of the breeding cow as contrasted with the fattening steer and, of course, with straight cattle production as compared with production from both sheep and cattle. Interest in this phase of meat production stems from the general argument that some day it may be necessary for this country to restrict its lamb production because of market saturation. In this event beef is the only foreseeable alternative if the national production level is not to stand still. In any event, an expanding local population must increase the need for beef. Beef production is a subject on which we have little factual information, but this study provides a little useful material.

The three farm units used were approximately 50 acres each and were similar in soil and pasture type. Topdressing was the same on each area. On the 4 ewes per acre farm 200 ewes were bought each February and managed on the Ruakura-recommended system of set stocking from lambing until weaning and on rotational grazing at all other times. Twelve 18-month-old and 12 weaner cattle were also carried, the weaners being bought each autumn or winter, depending on the feed supply. The breeding unit carried a breeding herd of 30 Aberdeen Angus cows. Twelve weaner steers and 5 replacement heifers were kept each autumn and the remainder of the calf crop sold. Twelve steer progeny were fattened off at 2 to 2½ years as chillers.

The average stocking rate thus consisted of 30 cows, 12 weaner steers, 12 18-month-old fattening steers, and 5 replacement heifers on the 50 acres.

On the bullock-fattening farm part of the cattle were bought in autumn each year and wintered on hay grown on the property and the remainder were brought on in spring as pasture growth became more plentiful. On the average 40 steers were wintered and 20 to 30 bought in spring, giving an average output of between 60 and 70 fat cattle per year. All cattle were typical 3- to 4-year-old stores from hill country. All hay used for wintering cattle on the three farms and for facial eczema control on the 4 ewes per acre farm was grown on the properties concerned. Each was managed as an independent unit.

Production Results

Mean output of meat per acre from the control area of 4 ewes plus cattle was 230lb. dressed weight. The breeding cow farm yielded 217lb. of dressed beef. The bullock area yielded 255lb. of meat per acre. The production of 230lb. of dressed meat from the 4 ewes per acre farm was 30lb. lower than that obtained in the first 4 years, when the figure averaged 260lb. This drop was due almost entirely to a lower beef output. The output of lamb meat was the same as in previous years. The drop in beef was due mainly to two relatively poor grass seasons, which resulted in poorer hay crops.

Production was also affected because in two seasons facial eczema precautions had to be taken and hay had to be diverted from use by cattle during winter to protection of the ewe flock. In these two seasons, in consequence, the cattle could not be bought until mid-winter, so that the area was deprived of part of its normal increment of beef.

The output from the breeding cow farm relative to that from the bullock farm substantiates the view that the breeding cow is a relatively inefficient producer of meat. Yield was nearly 40lb. of beef per acre less than that obtained from steer fattening. This figure reflects the lack of economy of maintaining approximately two breeding cows for the production of one steer. In the same way, the fact that the bullock farm yielded 25lb. more meat per acre than did the fat lamb farm is some measure of the high feed cost of maintaining a breeding ewe.

It has already been pointed out that the continuance of the 4 ewes per acre unit throughout the two periods allows comparison of the relative production under the five systems of stocking studied so far. After the necessary adjustments for seasonal differences had been made relative productions were as follows:—

		lb. per acre
4 ewes per acre	.. ..	245
6 ewes per acre	.. ..	245
8 ewes per acre	.. ..	240
Breeding cows	.. ..	230
Bullock fattening	.. ..	270

These figures can be described as the "expectancy" from different classes of meat-producing farms. This term has been borrowed from the dairyman, who evaluates his bull on the basis of the "expected" performance of his daughters. It is hoped that meat producers attempting any one of these systems will not be as frequently disappointed as dairy farmers are in obtaining the expected yields.

Cattle Gains

Some of the more interesting results of this study relate to the gains made by the different ages and types of cattle under the different stocking systems.

On the fat lamb area the cattle tended to suffer from competition with sheep. Though the average rate of gain of the stock from 1 to 1½ years was very good at 1.3lb. per day, that of the fattening animals was relatively poor, averaging only 1lb. per day. This was due primarily to the fact that under fat lamb conditions fattening cattle in spring and summer have to share available feed with ewes and lambs, and if necessary have to take second place. Cattle of the same age and over the same period on the beef cattle farm averaged 1.4lb. per day.

On the breeding cow farm the best performance was shown over the calf stage. Of extreme interest was the gain of 370lb. during the first 6 months of life of calves born on this area, exactly the same as it was during their next 12 months. Average rates during these two periods were thus 1.8lb. per day from birth to weaning and 1lb. per day from weaning until 1½ years old. The poorer performance during the older stage was probably due to the fact that preference under this system had to be given to stock actually being fattened. Thus, their older mates from 1½ to 2 and 2½ years of age averaged 1.4lb. gain per day. Cattle produced on this area were of very high quality, all grading as top level chillers.

The heavier cattle on the steer farm showed the highest gains. The cattle wintered gained an average of 2lb. per day from the time of purchase until fattening. Those bought in spring averaged over 2½lb. per day until slaughter later in summer. These very high gains are typical of stock that have gone through a long store period. When subsequently placed on ample feed such animals tend to make up rapidly for lost time by daily gains far ahead of those possible in an animal that has been well fed throughout its life. Though impressive, these gains suffer from the defect that a high proportion of them tends to be fat rather than lean meat.

The quality of the cattle from this block was poor for modern market requirements. They were excessively heavy for the export trade, carried too much fat, and the lean meat was coarse. It is quite obvious that, except for local production, there is little place, if any, in this country for this particular system of farming.

Profits

Despite the fact that the breeding cow farm produced only 13lb. of dressed meat per acre less than the 4 ewe per acre unit, the profits on stock were only half as much, £9 per acre as against £18.

Profit from straight fattening was even worse. Over the 3 years bullock fattening returned a profit on a stock account basis of only £7 per acre, despite the relatively prolific output of over 270lb. of dressed meat per acre. Again, this should be contrasted with £18 per acre from the 4 ewes plus cattle. It is obvious that straight cattle production, whether on a basis of breeding cows or fattening bullocks, is a system of farming possible only to the gentleman farmer in this country.

If the work of the 7 years is considered together, perhaps this last thought provides a key to the most important national outcome. It is obvious that future large-scale development of beef production in New Zealand depends on the relative prices of fat lamb, wool, and beef, as while the present ratio of lamb prices to beef prices continues and while reasonably high wool prices are maintained farmers cannot be expected to increase beef production to any material degree.

This does not mean that lamb prices should fall to the level of beef prices so that more beef will be produced. It means that the relative importance of the fat lamb and beef cattle industries in New Zealand depends on the relative prices paid for these two products.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during April as follows:—

1YA Auckland, 7.45 p.m.

2 April—"Autumn Pasture Management", by D. M. E. Merry, Instructor in Agriculture, Department of Agriculture, Pukekohe.

9 and 23 April—Talks by officers of Animal Industry Division, Department of Agriculture.

16 April—"Maintenance of Airstrips", by E. H. Arnold, Assistant Fields Superintendent, Department of Agriculture, Auckland.

30 April—"Drain Cleaning (Chemical)", by G. L. Banfield, Instructor in Agriculture, Department of Agriculture, Thames.

1XH Hamilton, 12.33 p.m.

14 April—"Wintering of the Ewe Flock", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

21 April—"Winter in the Vegetable Plot", by W. Brandenburg, Horticultural Instructor, Department of Agriculture, Hamilton.

28 April—"Overseas Farmers' Organisations", by C. D. May-Sommerville, Federated Farmers, Hamilton.

1YZ Rotorua, 7.15 p.m.

2 April—"Autumn Management of Pastures", by B. A. Gunning, Instructor in Agriculture, Department of Agriculture, Matamata.

16 April—"Management of the Ewe Flock", by K. Wilson, Livestock Instructor, Department of Agriculture, Opotiki.

30 April—"Winter Pasture Management on Dairy Farms", by A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga.

2XA Wanganui, 8 p.m.

3 April—"For the Country Woman", by Mary MacDonald.

10 April—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

17 April—"Pastures for Light Land", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

24 April—"Woolshed Design", by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Wanganui.

2YZ Napier, 7.10 p.m.

8 April—"Practical Hints to Poultry Farmers", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

22 April—"Autumn and Winter Work about the Dairy", by L. W. Scott, Farm Dairy Instructor, Department of Agriculture, Hastings.

2XG Gisborne, 8 p.m.

8 April—Talk by J. D. Overbye, Horticultural Instructor, Department of Agriculture, Gisborne.

22 April—"Autumn Sown Crops Are Valuable", by H. de O. Chamberlain, Instructor in Agriculture, Department of Agriculture, Gisborne.

2ZA Palmerston North, 12.33 p.m.

14 April—"Care and Management of New Pastures", by F. G. Spite, Instructor in Agriculture, Department of Agriculture, Masterton.

21 April—"Cut Flowers for Market", by J. B. Laurenson, Horticultural Inspector, Department of Agriculture, Palmerston North.

28 April—"Water Pumps in Their Right Place", by J. O. Brasell, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

21 April—"Review of 'The New Zealand Journal of Agriculture' ", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

2 April—"The Future of Farming", by Sir E. Bruce Levy, formerly Director, Grasslands Division.

9 and 16 April—"T.B. Testing", by S. Jamieson, Supervisor of T.B. Testing.

14 April—"Seasonal Stock Activities", by I. M. Cairney, Veterinarian, Department of Agriculture, Dunedin.

21 April—"Handling the Potato Crop", by A. R. Rankin, Fields Instructor, Department of Agriculture, Invercargill.

23 April—"Weeds and Pasture", by D. B. Edmond, Department of Scientific and Industrial Research, Palmerston North.

28 April—"Milking Machine Hygiene", by H. J. Dale, Dairy Instructor, Department of Agriculture, Dunedin.

30 April—"The Boar is Half the Herd", by I. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

4YZ Invercargill (following joint programme from 4YA and 4YZ)

14 April—"Autumn Saved Grass", by M. Smetham, Instructor in Agriculture, Department of Agriculture, Gore.

21 April—"The Year at the Works", by H. Cato, Supervising Meat Inspector, Ocean Beach.

28 April—"Plant Nutrition", by A. R. Rankin, Fields Instructor, Department of Agriculture, Invercargill.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month at 12.33 p.m.), Thursdays at 12.33 p.m.

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

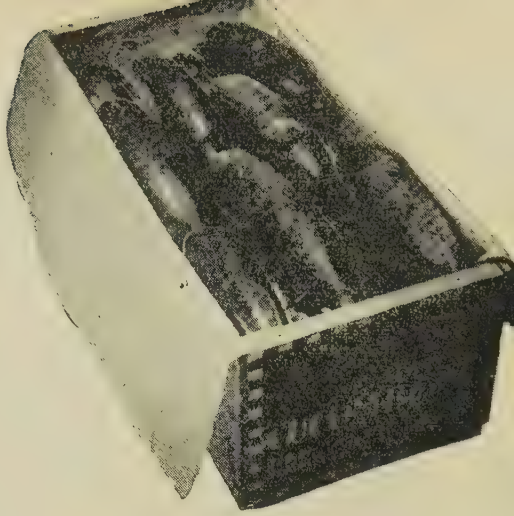
3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m. and 6.50 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m. and 7.15 p.m. (Lorneville and Gore stock market reports), Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m.

Growing Early Cucumbers

By B. P. COLEMAN and S. O. GILLARD,
Horticultural Instructors, Department of Agriculture, Auckland



THE cucumber (*Cucumis sativus*), a native of Africa and Asia, is undoubtedly the most popular member of the *Cucurbitaceae* family. The hardier outdoor varieties grow readily in most parts of New Zealand in summer and early autumn, but commercial production of early crops is undertaken mainly in the warmer districts of Auckland Province. The earliest cucumbers are grown in heated glasshouses, but unheated glasshouses, frames, and hotcaps are also used for early crops.

USUALLY production is combined with the growing of other crops, such as pumpkins, rock melons, tomatoes, and strawberries. Production ranges from 15lb. to 20lb. a plant for glasshouse and cold frame culture and up to 30lb. a plant in the open.

Seed

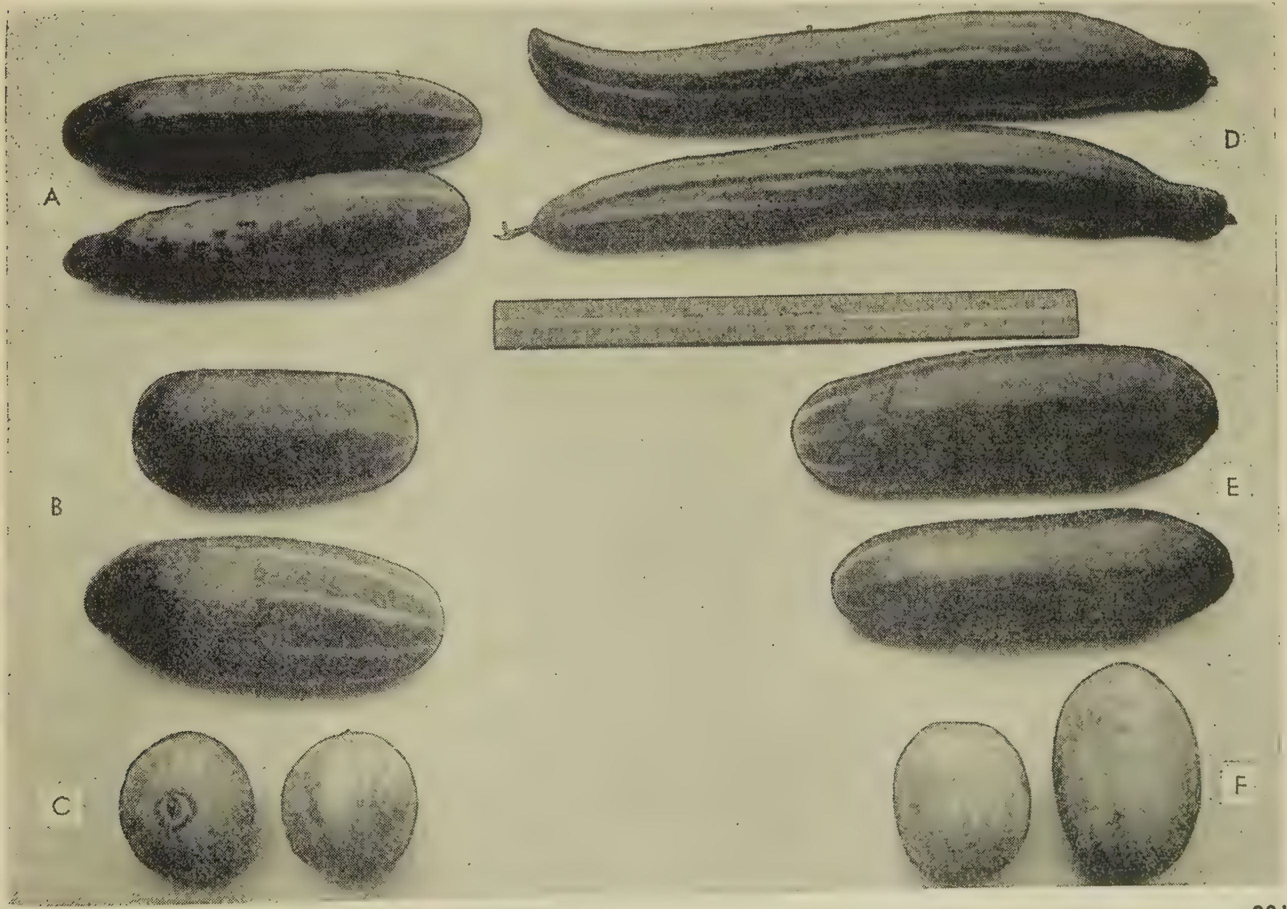
Many growers prefer to save their own seed and choose vigorous plants carrying heavy, disease-free crops of good shape. Poor-shaped fruits should be removed from the plant and the selected fruits left to mature thoroughly. In glasshouses it will be necessary to hand pollinate the female flower.

Seed Extraction

Seed extraction is best done by the acid method, 2 fl. oz. of commercial hydrochloric acid being used to each 5lb. of fruit. The pulp should be scooped into wooden or porcelain containers and the acid stirred into the pulp with a wooden stick. Occasional stirrings should be given during the next 3 hours, after which the seed may be washed in a fine sieve under running water before being set out in the sun to dry.

Propagation

Plants are raised under glass for setting out in their permanent positions. Seeds are sown in pots of sterilised compost in June for planting in the cucumber-type house and in August for cold frames and outdoors. It is usual to sow 3 seeds in each earthenware pot and allow the strongest plant to remain. The pots are set in large wooden trays 6in. in depth and half filled with sterilised potting mixture. All watering is done to the soil in the trays so that the collars of the plants are kept dry and the risk of



▼ Popular cucumber varieties. A—Long Prickly. B—White Spine. C—Apple. D—Telegraph. E—Money Maker. F—Crystal Apple.

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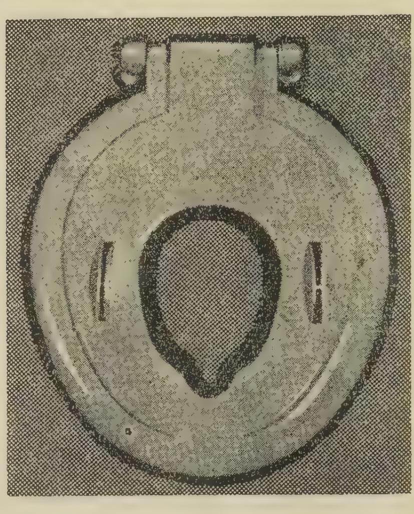

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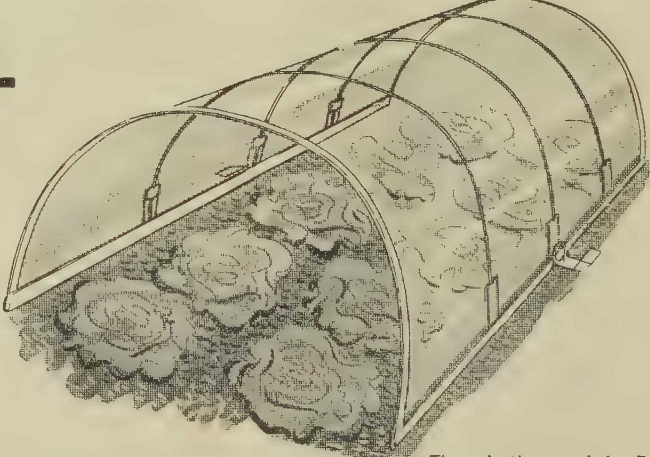
PLASTIC CLOCHES

The Frost-Bell Cloche is the achievement of several years of careful research into the factors affecting handling, strength and temperature variation. Frost-Bell Cloches have proved ideal for propagating, where a complete air seal is desirable, or for general cloche work, where ventilation can be quickly controlled by the method illustrated.
Nine inch wire staples hold the Cloche firm in all weathers. **Frost-Bell Cloches continually save you time. For cultivation, shifting, stacking and storing they can be quickly nest stacked and up to 3 dozen carried at a time.**
Still the same prices: 12/6 and 14/-.



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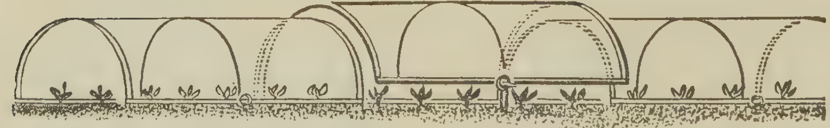

The plastics used in Frost-Bell Cloches are much heavier and longer lasting than even the plastic advocated for glass-house construction or rebuilding. However, all have the advantage of providing greater ultra violet ray penetration than glass and consequent improved plant growth.

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Frost-Bell Cloches, 565 Ferry Road, Christchurch.

collar-rot diseases reduced. Plants are retained in the pots until the root growth is sufficient to hold the soil together.

Varieties

Of the glasshouse types Telegraph is the main variety grown in heated houses. White Spine and Long Prickly are suitable for unheated houses. Money Maker and White Spine do well in cold frames and like the Crystal Apple variety are suited for field culture.

Plants ready for setting out. →

Manuring

From 4 to 6 weeks before planting the soil should be manured. An average manure comprises 20 parts of dry poultry manure, 7 parts of bonedust, 5 parts of superphosphate, and 1 part of sulphate of potash applied at 1 ton per acre for outdoor culture and 2lb. a sq. yd. for frames and houses.

Glasshouse Culture

The soil in the house should be sterilised about 4 to 6 weeks before planting takes place in late June. (In the tomato-type house planting should be delayed to mid-September.)

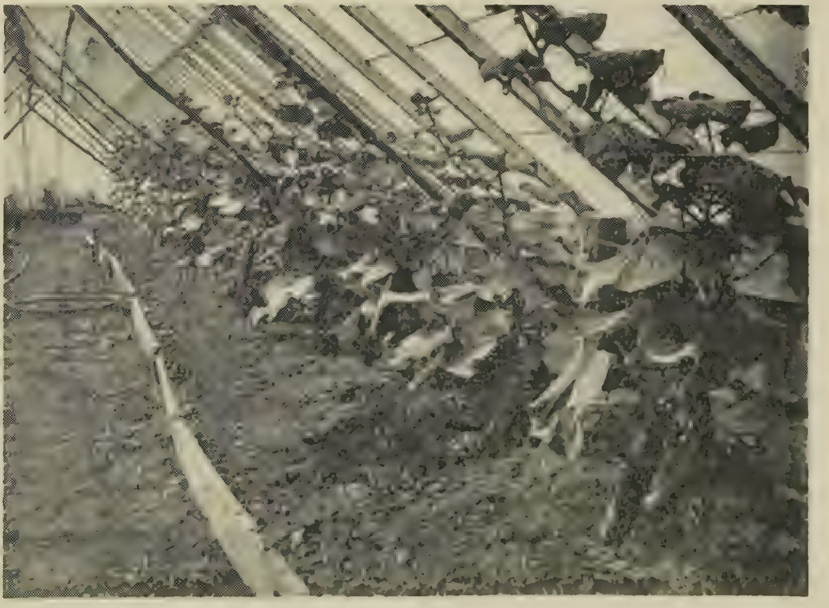
In cucumber houses the plants are set out 3ft. apart in single rows along the centre of the bed and in tomato-type houses they are planted 2ft. apart in rows directly beneath the overhead support wires.

Plants being raised in pots in propagating house. →

In cucumber houses the plants are allowed to grow until they have six true leaves, when the top is pinched out to induce lateral growths. When the lateral growths have reached about half-way up the wires the tops should be pinched out. To reduce the amount of tying the laterals should be trained between the wires and glass as much as possible.

All lateral growth is stopped at a point two leaves beyond the first fruit.

Male flowers should be removed to prevent female flowers being pollinated, which is likely to spoil the shape of the fruits. Older leaves should be cut out to make way for young leaves to develop. Fruit on main stems will not develop good-quality cucumbers and should be removed.

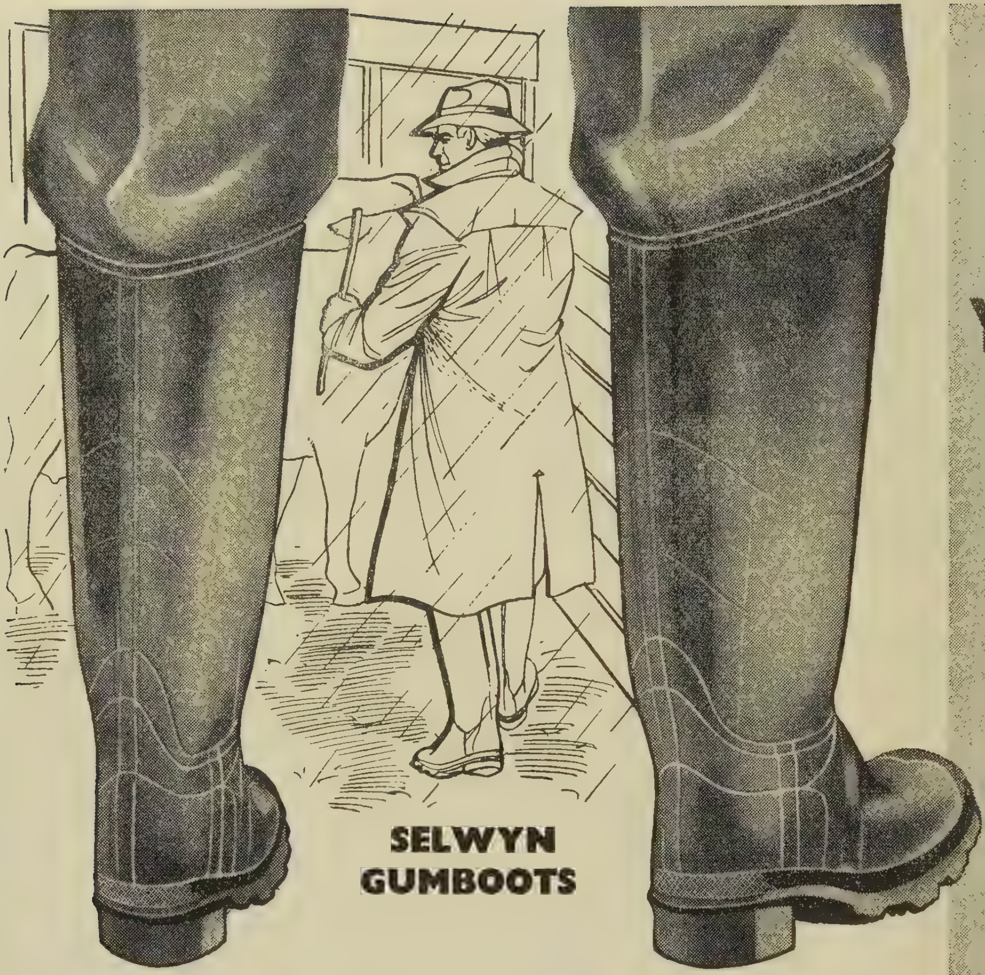


Inside of cucumber house, showing method of growing plants. →

When roots appear on the surface in cucumber houses they should be covered with ½in. layer of sterilised soil to which bonedust has been added at 3oz. per sq. yd. The practice is continued as fresh roots appear.

Free ventilation is necessary during the day and temperatures should be kept about 70 degrees F. and not ex-

PUT YOURSELF IN HIS BOOTS



Put yourself in his boots . . . What would YOU be wearing on your feet if you were mustering stock on a really bad day . . . and the yard was inches deep in mud. If you're wise, you'd be wearing Marathon Gumboots. Marathon are fine when the weather is wet . . . they're built to take it in their stride, and to give you real, "day-long comfort" month after month . . . year after year.

Over Ten Million pairs of rubber footwear have already been manufactured by Marathon.

Marathon
BY SKELLERUP

GUMBOOTS

Suitable frames for cucumber culture. Left—Good growth of vines.

ceeding 75 degrees F. Shading may be necessary from mid-November and the glass can be lightly sprayed on the outside with limewash (1lb. of hydrated lime to 20 gallons of water).

In the tomato-type houses a very shallow hoeing may be necessary from time to time to loosen up the soil after consolidation by frequent watering.

Watering is best done in the mornings, as this gives the soil time to warm up again before nightfall and avoids any check to plant growth. A good watering once a week is usually sufficient, but the soil should never be allowed to dry out to the stage of causing the plants to flag.

During hot weather the plants and floor of the house should be syringed twice daily to maintain humidity.

Cold Frame Culture

The soil and frame should be sterilised 4 to 6 weeks before planting in mid-September. The usual practice is to set plants out evenly in three rows of three in frames 9ft. x 4ft. 6in.

Frames should be set in warm positions and the beds manured a month before planting. To increase soil temperature the frames and sashes should be set out over the beds as soon as they are manured and prepared for planting.

As the plants grow, the tips of runners should be pinched back to promote lateral growth.

Warmth in the frames should be maintained by careful manipulation of

▼ Good growth made by plants inside tomato house.

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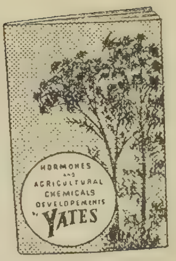

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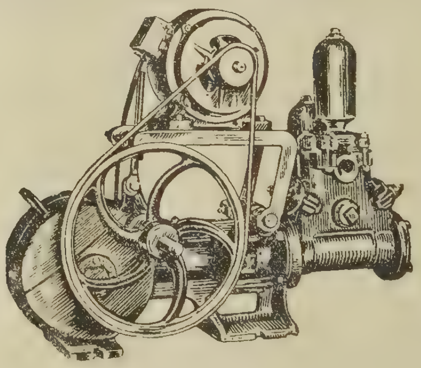

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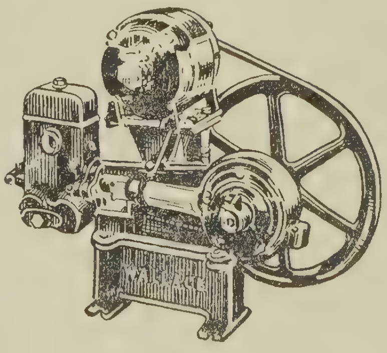

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the sashes; sufficient ventilation being provided without loss of heat. By the end of November night temperatures are usually sufficiently high to enable the sashes to be removed altogether.

The ground should be kept in the same moist condition as for glasshouse culture.

Outdoor Culture

By the use of hotcaps cucumbers can be produced 6 weeks earlier than those planted in the open without protection.

Hotcaps of waxed paper may be purchased made up. Many growers, however, make their own, using a special mould and white waxed paper which is ready cut to size 20in. x 22in.

Soil should be prepared and manured 4 or 5 weeks before planting is done about mid-September.

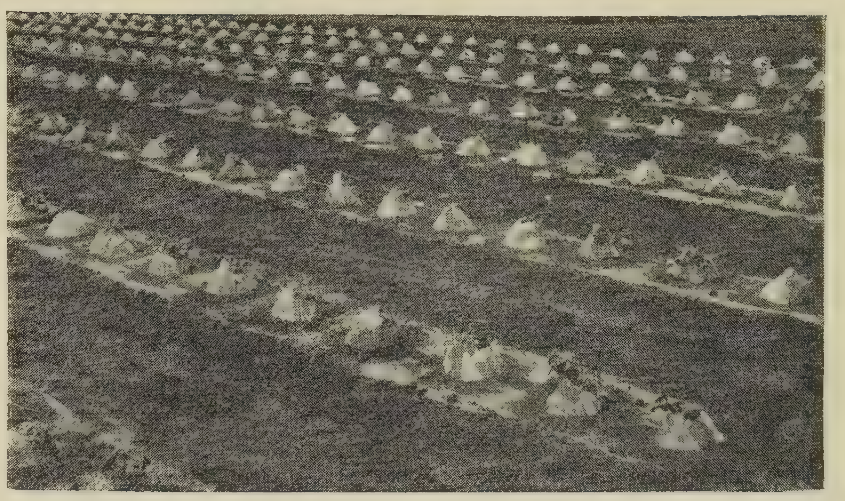
A day or two before planting is done shallow drills 6ft. apart should be drawn and blood and bone manure spread along the drills at 1lb. to each 2ft. of row and lightly worked in. To promote soil warmth, check weed growth, and also reduce excess moisture from reaching the plants 3ft.-wide black building paper should be laid over and along the drills and the edges buried about 3in. deep to hold the paper in place.

At planting, 4in. crossed slits should be cut in the paper at 2ft. intervals over the manured drills and the edges folded under to enable the plant to be set out, after which the paper is unfolded to cover the soil. A hotcap is placed over each plant and held by soil placed round the edge.

About 4 weeks from planting a slit should be cut in the top of the hotcaps to allow the plant to grow through. Neither runners nor laterals need be pinched back.

The only cultivation work required will be to work up the area between the paper strips and keep weed growth in check.

The same field as above some weeks later.



A field of hotcaps.

Disease Control

Cucumbers are subject to several diseases which can cause considerable losses if precautions and control measures are not adopted.

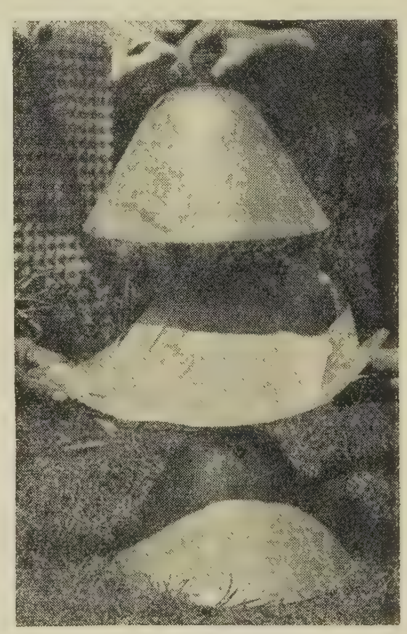
Mosaic Disease

Mosaic disease is caused by a virus. There is a slight yellowing of the veins and crinkling of the young leaves followed by a light and dark green mottle with blistering and distortion and some stunting of the plant. Occasional yellow flecks occur on leaves showing the green mottle and may be a prominent symptom. The fruit is usually free from marking, but may be slightly mottled.

Control: As mosaic may be seed transmitted, it is advisable to save seed only from healthy plants. Infected seedlings and plants should be carefully dug up and destroyed, the tools cleaned with disinfectant, and the hands washed with soap and water before handling healthy plants.

Aphids which transmit the mosaic may be controlled by fumigating or spraying with nicotine sulphate. HETP at 1 pint in 100 gallons of water or TEPP at ½ pint in 100 gallons of water may be used, but the following precautions should be observed:—

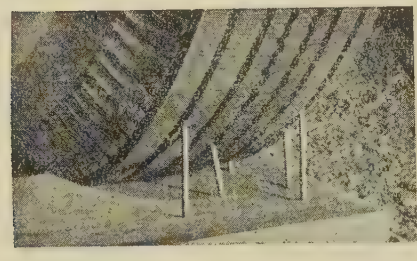
Hotcap being removed from the mould.



1. Avoid contact of concentrate with skin or mouth; use rubber gloves.
2. Immediately wash off any concentrate accidentally spilt on the skin with soap and running water. Wash after spraying is finished.
3. Keep the material away from the reach of children.
4. Do not eat, drink, or smoke while spraying.
5. Leave the spraying area if inhalation of spray vapour causes headache and tightness of the chest.

Mildew

Cucumbers are subject to two mildew diseases—powdery mildew and



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downy mildew. Both are prevalent during warm, humid weather, but the former can also develop under relatively dry conditions.

Powdery mildew (*Erysiphe cichoracearum*): Appears as white powdery spots on the shaded portions of the main stems and on the under surfaces of the older leaves. Later the spots may cover the whole leaf surface. Once established the disease will spread rapidly throughout the crop.

Downy mildew (*Pseudoperonospora cubensis*): Appears as more or less angular, yellowish spots on the leaves, and on the lower surface of these a rather scanty, white, downy growth develops. The individual spots are rarely over ½in. in diameter, but may coalesce, resulting in the death of the whole leaf.

Bordeaux mixture 3 : 4 : 50 (3lb. of copper sulphate and 4lb. of hydrated lime to 50 gallons of water) is effective for the control of both downy and powdery mildew. Applications should be made every 7 to 14 days according to weather and the severity of the diseases.

Powdery mildew is the more common of the two and may be controlled by using "Karathane", which leaves practically no residue on the fruits. "Karathane" may be used as a dusting powder or, as a spray, the wettable powder form may be used at 1lb. to 2lb. to 100 gallons of water. Applications should be at 7- to 14-day intervals until the mildew is controlled.

Grey mould (*Botrytis cinerea*) produces a dense, grey, velvety, fungous growth on the stems and tips of the young fruits and may cause severe damage under very humid conditions.

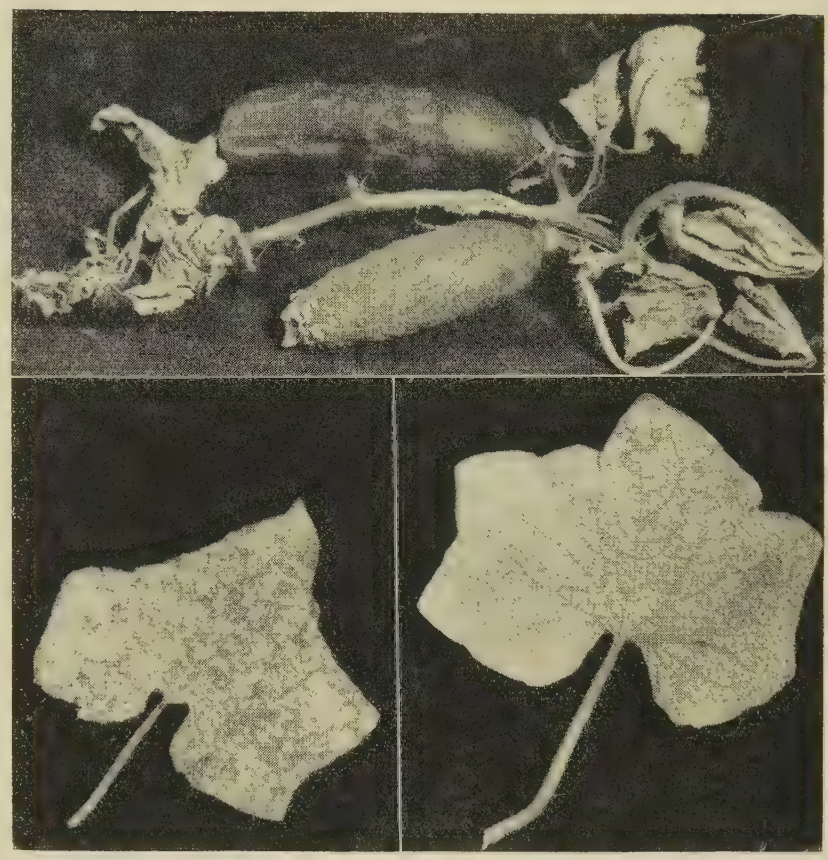
Control: It can be prevented by attention to ventilation and plant hygiene. If infection occurs, however, spraying the plants with 4lb. of thiram (50 per cent. wettable powder) in 100 gallons of water will keep the disease in check.

Sclerotinia disease (*Sclerotinia sclerotiorum*): Affected areas on stems become bleached in appearance and infection is followed by wilting of the foliage. If the infected portion of the stem is cut open, hard, black, irregular-shaped bodies will be found lining the hollow portion.

Control: Infected plants should be removed and burnt and the soil sterilised before it is used again for a cucumber crop.

Verticillium wilt (*Verticillium alboatrum*): Leaves become yellow from the base of the plant upward and the whole plant wilts. If the stem is cut open longitudinally, the wood is seen to be discoloured brown. Mainly occurs in spring when temperatures are low.

DISEASES OF CUCUMBERS



Upper—Sclerotinia disease. Lower left—Powdery mildew. Lower right—Leaf infested with red spider mite.

Control: Infected plants should be removed and burnt. Sterilise soil indoors before next crop.

Fusarium wilt: Symptoms are similar to verticillium wilt, but disease is mainly troublesome when temperatures are high.

Control: Infected plants should be removed together with the soil round the roots. The holes may then be filled with a solution containing 1oz. of copper sulphate in 2 gallons of water and replanted. Diseased plants should be burnt and soil indoors sterilised before the next crop.

Anthracnose (*Colletotrichum lagenarium*) sometimes causes damping off of cucumber seedlings, but does not usually appear on the plants until they are well established. Pale-green, water-soaked spots form on the leaves. These enlarge rapidly and become reddish brown in the centre, surrounded by a yellowish water-soaked zone. Finally these blotches run together and the leaf dries up and appears scorched.

Sunken, elongated, water-soaked areas also appear on the leaf stalks and stem and may girdle the latter, causing the plant to wilt. Similar pale-green sunken areas are produced near the tips of the fruits; they finally crack and expose the internal tissues, and the fruit becomes yellow and dies off.

Control: Adequate ventilation should be given indoor crops and the plants sprayed each week during the early stages of attack with bordeaux mixture 3 : 4 : 50.

For field culture, crop rotation and spraying the plants with bordeaux mixture during the growing period are recommended and if infection is severe, the removal and burning of all plants at the end of the season is necessary.

Red spider mite (*Tetranychus bimaculatus*): A mite which can scarcely be seen without a lens. In heavy infestations the leaves turn yellow and later die. The tiny yellow to red insects feed on the under sides of the leaves.

Control: Spray with HETP or TEPP as for aphids.

All photographs by Sparrow.

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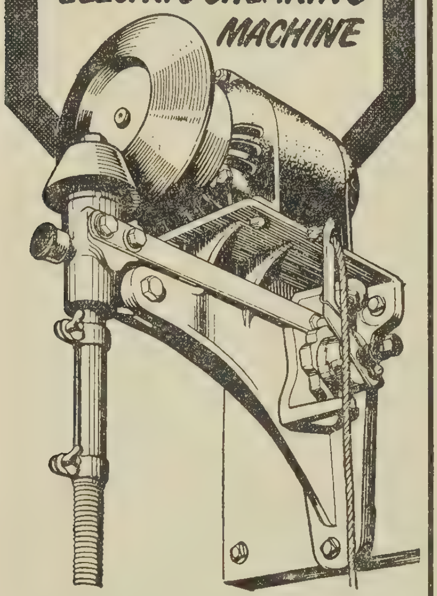

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Our economic loss from livers rejected for export because of hydatid cysts is £1,500,000 a year.
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Dogs infect sheep and humans. Dose your dogs regularly and carefully as a second line of defence.
STOP hydatid infection from passing on by boiling all offal used for dog food.

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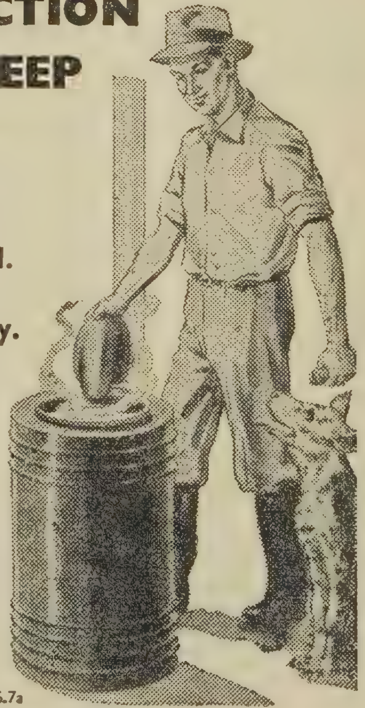

Certification of Legume Seed Inoculants

By E. E. CHAMBERLAIN,
Director, Plant Diseases Division,
Department of Scientific and
Industrial Research, Auckland

THE inoculation of lucerne seed with root nodule bacteria has been considered good farming practice for many years, and the Plant Diseases Division was responsible for supplying culture in steadily increasing amounts over a period of 28 years.

RECENT research work in New Zealand has shown that establishment and growth of clovers are greatly assisted by inoculation with an efficient clover culture. Inoculation is of particular value in virgin or second-class country where the soil often lacks nodule bacteria or contains only ineffective strains.

Nodule bacteria are able to "fix" atmospheric nitrogen and make it available to the legume host plants. As most legumes have a high nitrogen requirement, good growth is dependent on the presence of nodule bacteria unless the soil has a high nitrogen content.

During the past three seasons commercial lucerne and clover cultures have come on to the New Zealand market and are now readily available from seed merchants. The Plant Diseases Division therefore decided to cease lucerne culture production and no cultures have been dispatched since the end of last season.

Two types of commercial cultures are available. The first is the agar or wet culture which is packed in a glass mission bottle containing an agar jelly on which a slimy film of the legume bacteria is growing. Commercial agar cultures are similar in type to the culture previously supplied by the Division. For use the culture is mixed with skimmed milk, ½ pint for every 30lb. of lucerne, red clover, or subterranean clover seed and 1 pint for every 30lb. of the smaller seeded white clover. The milk plus the culture is mixed with the seed in a clean container. After mixing the seed is spread on a clean cover away from direct sunlight to dry, the seed

Trade name	Manufacturer and/or agent	Carrier	Certified for
	CLOVER		
Biolab C. Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland	Agar	Red, white, and sub. clovers
Biolab C. Peat		Peat	
Glaxo Legume Inoculant	Glaxo Laboratories (N.Z.) Ltd., P.O. Box 624, Palmerston North	Peat-Pumice	Red and sub. clovers
Inoculaid C. Agar	Biological Laboratories Ltd.; Dalgety & Co. Ltd., P.O. Box 1397, Wellington, and branches	Agar	Red, white, and sub. clovers
Inoculaid C. Peat		Peat	
Inoculator C. Agar	Biological Laboratories Ltd.; Farmers' Co-op. Wholesale Federation N.Z. Ltd., P.O. Box 1124, Wellington, and Farmers' Co-op. organisations	Agar	Red, white, and sub. clovers
Inoculator C. Peat		Peat	
Legulon C. Agar	Biological Laboratories Ltd.; Wright Stephenson & Co. Ltd., P.O. Box 1895, Wellington, and branches	Agar	Red, white, and sub. clovers
Legulon C. Peat		Peat	
National C.	Biological Laboratories Ltd.; National Mortgage & Agency Co. of N.Z. Ltd., Dunedin, and branches	Peat	Red, white, and sub. clovers
Nitrogon C. Agar	Biological Laboratories Ltd.; Pyne, Gould, Guinness Ltd., P.O. Box 112, Christchurch, and branches	Agar	Red, white, and sub. clovers
Nitrogon C. Peat		Peat	
Nodulaid C.	Agricultural Laboratories Pty. Ltd., Sefton, Australia; N.Z. Loan & Mercantile Agency Co. Ltd., P.O. Box 1498, Wellington, and branches	Peat	Subterranean clover
Nod-O-Gen 2 in 1	The Albert Dickinson Co., Chicago, U.S.A.; Seed Inoculants (Nod-O-Gen) Ltd., P.O. Box 7, Ashburton, N.Z.	Humus	Red, white, and sub. clovers, and lucerne
	LUCERNE		
Biolab L. Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland	Agar	Lucerne
Biolab L. Peat		Peat	
Glaxo Lucerne Inoculant Agar	Glaxo Laboratories (N.Z.) Ltd., P.O. Box 624, Palmerston North	Agar	Lucerne
Glaxo Lucerne Inoculant Peat-Pumice		Peat-Pumice	
Inoculaid L. Agar	Biological Laboratories Ltd.; Dalgety & Co. Ltd., P.O. Box 1397, Wellington, and branches	Agar	Lucerne
Inoculaid L. Peat		Peat	
Inoculator L. Agar	Biological Laboratories Ltd.; Farmers' Co-op. Wholesale Federation N.Z. Ltd., P.O. Box 1124, Wellington, and Farmers' Co-op. organisations	Agar	Lucerne
Inoculator L. Peat		Peat	
Inoculo 1	Inoculo Laboratories, 72 Victoria Crescent, Mont Albert, Melbourne, Australia; A. S. Paterson & Co. Ltd., 209 Cashel Street, Christchurch	Peat	Lucerne
Legulon L. Agar	Biological Laboratories Ltd.; Wright Stephenson & Co. Ltd., P.O. Box 1895, Wellington, and branches	Agar	Lucerne
Legulon L. Peat		Peat	
National L. Agar	Biological Laboratories Ltd.; National Mortgage & Agency Co. of N.Z. Ltd., Dunedin, and branches	Agar	Lucerne
National L. Peat		Peat	
Nitrogon L. Agar	Biological Laboratories Ltd.; Pyne, Gould, Guinness Ltd., P.O. Box 112, Christchurch, and branches	Agar	Lucerne
Nitrogon L. Peat		Peat	
Nodulaid A.	Agricultural Laboratories Pty. Ltd., Sefton, Australia; N.Z. Loan & Mercantile Agency Co. Ltd., P.O. Box 1498, Wellington, and branches	Peat	Lucerne
Nod-O-Gen 1	The Albert Dickinson Co., Chicago, U.S.A.; Seed Inoculants (Nod-O-Gen) Ltd., P.O. Box 7, Ashburton	Humus	Lucerne
Nod-O-Gen 2 in 1	The Albert Dickinson Co.; Seed Inoculants (Nod-O-Gen) Ltd.	Humus	Lucerne and red, white, and sub. clovers

being stirred occasionally. When dry it is ready for sowing.

The second type of culture is the peat or powder culture. In this type, finely ground peat is used as the carrier for the legume bacteria. For use the culture is first mixed with water, 1 pint for every 30lb. of seed, and the mixture added to the seed before mixing; or the peat is dusted over the seed and the water added and then mixed well. Results in trials with both types of cultures have been satisfactory. There has recently, however, been some criticism of the use of water with the peat cultures, and better adherence of the peat to the seed is obtained if skimmed milk as used for agar cultures is used in place of water.

As cultures contain large numbers of living bacterial organisms, extreme care must be taken to ensure that inoculated seed is not mixed with any acid fertiliser. It is essential that the instructions issued with each culture be followed implicitly if efficient inoculation is to be obtained.

To provide farmers with information which will enable them to procure efficient tested strains of legume cultures a voluntary scheme for the certification of legume seed inoculants is being carried out by the Plant Diseases Division. At present only cultures for the inoculation of lucerne and red, white, and subterranean clovers are being tested.

Farmers may buy any culture certified by the Division knowing that it has been thoroughly tested and found to be efficient for legume inoculation. Final success with such cultures is dependent on strict adherence to manufacturers' instructions and the application of normal principles of good farm management.

Legume inoculants certified by the Division as at October 1957 are listed. The information given contains the trade name, the name of the manufacturer or agent, the carrier used for the inoculant, and the legumes for which the inoculants are certified.

Fruit Crop Estimates for 1957-58 Season

THE following estimates made in January of the fruit crop for the 1957-58 season are in 000's of bushel cases. They are summarised from information supplied by field officers of the Horticulture Division of the Department of Agriculture. Districts producing less than 500 bushels of a variety are not shown, but are included in totals. District totals of more than 500 are rounded to the nearest 1000.

FRUIT	DISTRICT								
	Auckland Province except Gisborne	Gisborne	Hawke's Bay	Wellington and Taranaki Provinces	Nelson Province	Marlborough	Canterbury and North Otago	Central Otago	Total 000 bushels
APPLES—									
Ballarat	73	7	95	2	7	7	15	1	207
Cox's Orange Pippin ..	10	2	107	1	113	13	18	13	278
Delicious	34	7	182	4	203	27	28	49	534
Dougherty	17	4	75	—	29	2	—	—	126
Granny Smith	107	4	160	6	100	3	3	5	388
Gravenstein	21	—	42	—	64	1	2	2	132
Jonathan	9	—	59	1	251	35	19	33	407
Sturmer	7	5	255	12	370	37	66	42	793
Others	109	5	237	10	183	19	52	54	670
Total	387	34	1,212	36	1,320	144	203	199	3,535
PEARS—									
Beurre Bosc	4	1	4	—	9	—	—	—	18
Louise Bonne de Jersey	2	—	26	—	1	—	—	1	29
Packham's Triumph ..	11	—	11	—	9	—	—	—	31
P. Barry	7	1	23	—	6	—	2	—	39
W. B. Chretien ..	20	—	90	—	55	—	5	9	180
Winter Cole	1	1	73	—	46	1	7	7	136
Winter Nelis	—	1	51	—	10	1	3	14	79
Others	30	—	9	1	14	1	10	6	71
Total	75	4	287	1	150	3	27	37	583
OTHER FRUITS—									
Peaches	101	15	402	2	57	7	9	93	686
Apricots	3	1	7	—	1	—	19	141	172
Nectarines	2	2	16	—	2	—	2	28	52
Plums	58	3	96	—	11	2	12	35	217
Cherries	—	—	1	—	1	3	2	11	17
Quinces	6	—	8	—	3	—	1	1	19

New Director of Crop Research Division

Dr. L. Corkill, who has been appointed Director of the Crop Research Division of the Department of Scientific and Industrial Research, Lincoln. He was previously Chief Plant Breeder, Grasslands Division of the Department, where he was engaged on the breeding, for New Zealand conditions, of several pasture plants. Notable in this field have been his efforts in the breeding of short-rotation ryegrass. Dr. Corkill is president of the New Zealand Grassland Association and in 1956 took part in the Seventh International Grassland Congress held at Massey Agricultural College.

Main Wool Sales

The dates and venues of main wool sales are:—

19 and 21 March: Auckland.
26 and 28 March: Napier.
2 April: Wellington.
21 April: Christchurch.
26 April: Invercargill.
30 April: Dunedin.
15 May: Wanganui.
19 May: Auckland.
24 May: Napier.
28 May: Wellington.

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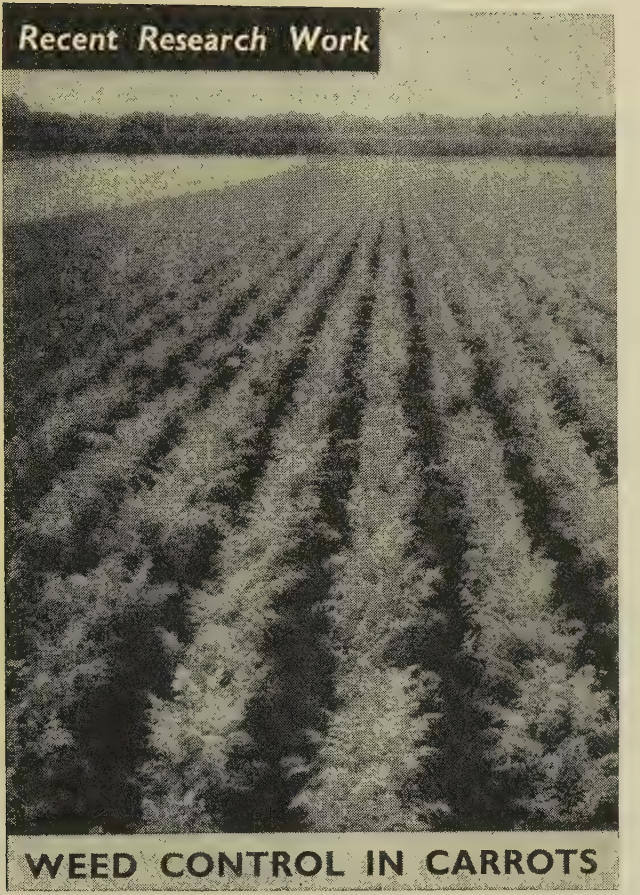

Recent Research Work

WEED CONTROL IN CARROTS

OVER the past three seasons at the Department of Agriculture's Invermay Research Station a large range of pre-emergence herbicides for use in carrot crops has been examined, including, at the start of these investigations, many new herbicides such as TCA and NPA.

MATERIALS USED

The pre-emergence materials were of two distinct types, residual and contact. The residual materials examined at Invermay were NPA, TCA, monuron (formerly called CMU), fenuron (formerly called PMU), and CIPC, and the contact types were oktone and PCP.

The residual materials act through the soil and their residual toxicity in the soil makes them suitable for crops that are in the ground for a long period. In practice, however, residual-type pre-emergence herbicides do not find great favour in climates such as those of New Zealand and Great Britain, because the weather is changeable and relatively unpredictable. For example CIPC under average soil temperatures will cause relatively little crop damage, but high soil temperatures will generally result in a reduction in germination and vigour. Also, TCA cannot work unless it is washed by rain through the soil to the roots of germinating seedlings, but too much rain can place it beyond their reach. Thus the action of this type of herbicide is, to a large extent, beyond the control of the grower.

However, the contact pre-emergence herbicides can be used in conditions where the grower has relatively more control in that the "stale seed-bed technique" can be utilised. The seed-bed is prepared to the final detail, but drilling of the crop is delayed by from 7 to 14 days, with as little disturbance of the germinating weed seedlings as possible and a few days before emergence of the crop a contact herbicide, such as PCP or oktone (which has little or no residual toxicity), is sprayed over the weeds which have emerged. Such a system has obvious practical difficulties, but at least the grower is not as much at the mercy of soil and weather.

RESULTS

Of the residual pre-emergence chemicals only CIPC gave good results for two seasons, and so in the third season a full-scale rates-of-application trial was laid down. High rates (6lb. to 8lb./acre) were found to be necessary to give satisfactory control of weeds such as fat-hen, wireweed, and sow-thistle. Though CIPC at 8lb./acre twice gave significantly higher yields than the control, it is felt that under a wider range of conditions dosages should be kept down to 6lb./acre, until individual experience has shown whether 8lb. is warranted.

The effect of CIPC on flavour has been investigated, but could not be proved significant in the first season. An intensive examination of the taste factor with the past season's trial showed that only 2 out of 12 tasters could detect a significant flavour difference with CIPC. The degree of difference could not be determined, but the conclusion was that there is a flavour difference with CIPC which can be detected by some people.

Of the contact herbicides PCP (in a non-persistent emulsifiable oil formulation) has been on trial for only one season, and the results at 3lb. and 4lb./acre were very disappointing. On the other hand oktone, with kerosene as a carrier, has given 100 per cent. control of weeds emerged at the time of spraying, but each season a second generation of weeds quickly appeared and within 6 weeks they seemed to be just as bad as on unweeded plots. However, the use of such a material means that as soon as the carrots emerge inter-row hoeing can be started, because the drills can easily be seen. Thus such a treatment is sound commercially.

Post-emergence spraying is probably still the main commercial method of controlling weeds in carrots. Power kerosene, originally the widest used herbicide for carrots, is now being replaced (after some adverse publicity because of taint) by the more expensive proprietary brands of selected white spirit. Kerosene properly applied will do a good job. It must be applied when the weeds are young, extremes of heat must be avoided or crop damage will occur, and correct spray distribution and droplet size will enable the grower to achieve excellent control with volumes of only 30 gallons/acre. Crop tainting is likely to occur only where late application necessitates heavy dosages. Crop damage is less likely to occur with the white spirit, and it is claimed that there is less risk of taint.

—F. A. MEEKLAH

Shrubs for Difficult Positions

MANY gardeners, especially if they are new to a district or have only just started gardening, are tempted to grow some particular shrub or shrubs without giving due thought to the type of soil or situation in which the plant will be growing. The local nurseryman will often be of great assistance in recommending suitable shrubs, but should supplies be short, the customer may take something else which will not be satisfactory. In such a case it would be preferable to wait until the following season to get what is required rather than spend time and trouble in trying to grow something that is obviously not suited to the situation. In this article by Elspeth Gray, Horticultural Instructor, Department of Agriculture, Auckland, shrubs are dealt with under various headings: Those suitable for damp situations, ones that will tolerate wind, shrubs for dry, sunny positions, and those that tolerate acid soils or thrive in them.

THE section of this article which deals with routine work for April is by Rosalie A. Campion, Horticultural Instructor, Department of Agriculture, Wellington.

Windy Situations

Thuja occidentalis Rheingold is a very attractive golden conifer, the leaves of which turn bronze in autumn. It has a spreading habit, but if properly pruned and looked after can be made into a fairly compact shrub. Pruning consists mainly of shortening back long side branches that are spoiling the shape. As with most of the shrubs that are grown in windy positions, thuja requires a little shelter until it is fully established.

Some of the berberis family will stand wind and brighten the garden in autumn with a vivid display of coloured foliage or berries. *Berberis thunbergi atropurpurea* has purple leaves during spring and summer, changing to clear autumn tints in a wealth of colour. *B. wilsonae* is also well worth growing both for its coral red berries and the colour of the autumn foliage.

A good standby for any situation is *Buddleia salvifolia,* which grows very quickly and requires little attention apart from pruning to keep it a reasonable shape. The mauve flowers are not unattractive, but are not recommended for picking, as the scent is very strong and becomes overpowering indoors. Buddleia does not remain attractive over a long time as do the slower-growing shrubs, but it is excellent for providing shelter, as it grows quickly and can be removed once the better shrubs have become established.

Chaenomeles japonica (*Cydonia japonica*), the flowering quinces, are worth a place in gardens, especially those which are exposed to a good deal of wind. They produce masses of flowers in early spring, well before the leaves appear, in a range of shades from white to scarlet and crimson. One or two varieties have almost orange flowers. The fruit from these shrubs may be used for making jelly, but otherwise have very little culinary use. Flowering quinces may also be grown as a hedge, provided they receive sufficient pruning to prevent the hedge becoming bare at the base.

The lantanas will provide flowers for up to 8 months of the year until they are checked by the colder weather, but they are too frost tender for growing in the south. These are evergreen shrubs 3ft. to 4ft. high and include some semi-climbing varieties, with a wide range of flower colours: white to mauve or pale yellow and

Camellia sasanqua. The variety → shown is Hiryu, one of the early flowering varieties, which has semi-double, rosy red blooms. Elliott photo.

numerous two-coloured forms. The flowers are similar in shape to verbenas and last on the bushes over a long time. Hard pruning after flowering may be necessary to induce the formation of a neat, compact shrub.

Several varieties of cotoneaster are suitable for a windy situation. They vary in height from 2ft. to 15ft. Nearly all are hardy and produce in autumn excellent displays of scarlet berries which are very good for decorative work. *Cotoneaster bullata* is a good, fairly tall specimen tree with autumn-tinted foliage and brilliant red berries. *C. wardi* grows slightly smaller than *C. bullata* with showy, orange-scarlet berries that last well into winter. Among the more dwarf varieties, *C. horizontalis* is frequently used for covering walls or banks, or it may be allowed to grow naturally in the front of a shrub border to fill a gap. It, too, has vivid scarlet berries down the lengths of the stems.

Good Spring-flowering Shrub

A good spring-flowering shrub of medium height is *Eriostemon myoporoides*. It is an evergreen and is covered with starry white flowers over a long period. Where possible it should not be grown too near the house, as bluebottle flies are attracted both by the scent and by a substance present on the leaves. This is a naturally neat shrub and can be kept to any desired size by pruning when the flowers have finished.

The native veronicas, or hebes as they are now called, are ideal for filling in spaces where the less hardy shrubs would not thrive. They are quick growing and require little attention other than trimming to prevent them from becoming too leggy. The flowers of the species are not very showy, but some of the newer hybrids have sprays of blue, mauve, pink, or crimson flowers that remain on the bushes over a long time. Autumn Beauty is blue, Speciosa Pink a clear rose pink, and Simon Deleaux a rich, deep purple, to give only a few examples of the colours.

Philadelphus, the mock oranges, or as they are sometimes wrongly called, syringas, produce fragrant white flowers in late spring and early summer. For best results the soil should be enriched with compost or decayed animal manure and the shrubs planted in full sunlight. If there is a really draughty place in the garden where nothing else will grow, one of the varieties of philadelphus should be tried, as they are tolerant of, and will even thrive in, a draught.

All varieties are deciduous and pruning consists mainly of the removal of old wood that has borne flowers, leaving the young lateral growths. Where it is desired to bring an old bush back into shape it may be cut hard back in September or October, though this means sacrificing a season's flowers.

P. lemoinei erectus, growing to 4ft. to 5ft. and with large, fragrant white flowers, is one of the best varieties of philadelphus for the home garden, as it does not grow too rampantly. Where space is available philadelphus should be planted where the full beauty and perfume of the blossoms may be appreciated.

Roses, though they require a certain amount of shelter from strong winds, may be included among the shrubs in this section. Bush roses are preferable to standards in windy situations and, by careful selection, will blend with the colours of other shrubs.

Escallonia Fields' Scarlet is a hardy evergreen which grows to 6ft. or more in a favourable situation, but it can be kept in check by careful pruning and trimming. The bright scarlet flowers are carried on the bushes from late spring to late summer. It will grow in almost any conditions provided the soil does not dry out too much in summer or become waterlogged in winter. Escallonias set seed very freely and unless it is wanted for sowing, the spent flower heads should be removed periodically to ensure a continuous supply of flowers.

To lighten a dark corner or for planting with evergreen shrubs the golden euonymus (*Euonymus japonicus variegata*) is excellent. With careful attention it will form a shapely shrub or small tree, growing eventually to 10ft. or more high. This form seldom has berries, but occasionally some specimens produce a few.

← *Acacia baileyana*, one of the earliest acacias to flower, has a mass of clear golden blossoms. Elliott photo.

[*Elliott*

Viburnum carlesi is a deciduous shrub with scented pink flowers fading to white which flowers in early spring.

Any green shoots that appear on the golden variety should be removed immediately they are noticed, as if they are left, the shrub will eventually revert to the ordinary green type. The reason is that the green leaves manufacture more plant food than the yellow ones, and therefore grow more vigorously. Trimming to maintain the shape and the removal of the unwanted green shoots are the only pruning necessary.

The leaves are useful for indoor decoration and the beauty of the foliage compensates for the lack of the showy berries which are a feature of *Euonymus europaeus* in autumn.

Damp Situations

By damp situations is meant soil that has more than adequate moisture over the greater part of the year and yet is reasonably well drained. Few ornamental shrubs will succeed where there is water lying round their roots even for a short time during winter.

The Chinese lanterns (abutilons) are now available in a wide range of colours, some of them most attractive and with considerably larger flowers than those of the older varieties. In a favourable position they will grow to about 6ft. or more, but need shelter from frost. In the colder districts of the South Island it would be inadvisable to try growing them, no matter how much shelter is provided. By judicious pruning they can be kept to a desired height. Pruning after flowering is also necessary, as these shrubs can become very untidy if left untouched.

Lilacs

Lilacs (syringa) are an old favourite, with new forms constantly being brought out. Double, semi-double, and single flowered varieties are available in shades of deep lilac, almost blue, and white, as well as the ordinary lilac shade. As these shrubs are nearly always worked on to privet stock, which will grow in practically all cooler areas, it is possible for lilacs to be grown under a wide variety of conditions. They are not recommended, however, for the Auckland district, as they require a colder winter to flower successfully.

If the shrubs are exposed to very strong winds, the flowers will suffer considerable damage, and even with a moderate amount of wind staking will be necessary. Normally with lilacs enough pruning will be done when the flowers are being picked, provided they are cut with the future shape of the bush in mind and not taken indiscriminately from one place.

For the front of a border or a situation where low-growing shrubs are required the dwarf hydrangeas make good subjects. These can be kept to 3ft. high or even less and produce flowers equal in quality, though not in quantity, to those of the taller varieties. They are available at present mainly in shades of pink and red and give a show of colour that is unexpected from such small bushes. Like ordinary hydrangeas, the dwarf ones need pruning each winter to remove as much old wood as possible. To ensure that the red colours remain true, a topdressing of lime at 2oz. to 3oz. to the square yard should be applied during winter or early spring.

Other low-growing shrubs are the ever-popular daphnes, which prefer semi-shade in the warmer districts and full sun further south. *Daphne odora rubra* is the one most commonly grown, but in Auckland districts it would be better to plant either *D. burkwoodi* or *D. leucanthe*, as neither of these is so susceptible to the virus that affects *D. odora*. Both these varieties have the typical daphne scent, and flower in late winter or early spring.

Also suitable for the front of the shrub border are the adenandras, which grow to only 2ft. high and form attractive, compact shrubs. *Adenandra fragrans* (pink) and *A. uniflora* (white) can both be recommended. They carry a few star-shaped flowers over a long time rather than producing a mass of colour for just a short period. These shrubs are evergreen and the foliage shows up the flowers, which are good for cutting for decoration.

Growing slightly taller than the above is the Lily of the Valley shrub (*Pieris japonica*). It has a compact habit of growth and produces a mass of white, bell-shaped flowers in early spring. To add to its attractiveness the young foliage is tinted red, deepening to green just before the flowers appear.

The tendency is perhaps to give viburnums greater care than they really need, and consequently these extremely good ornamentals are not used perhaps as much as they might be. The evergreen varieties, such as *Viburnum japonicum*, are valued for scarlet berries and autumn tonings. Deciduous ones, such as *V. carlesi* and *V. fragrans*, produce pink and white sweetly scented flowers in early spring. *V. burkwoodi* is an evergreen that also has scented flowers.

The widely known snowball tree, *V. opulus sterile*, is another good shrub where something taller and more showy is required. It carries large, creamy white balls of flowers in late spring. Its vivid autumn colouring in colder districts also adds to its attractiveness.

The early flowering camellias (*Camellia sasanqua*) are invaluable where flowers are wanted in late winter in districts where the likelihood of frost damage is not too great. The average height of these shrubs is 4ft., but they may eventually reach 8ft. in a sheltered position where drainage is good. *C. hiryu* is a semi-double rosy red, *C. monozono* a good shell pink, and Moonlight a variety with large single white flowers.

In addition to this list, *Buddleia salvifolia*, *Eriostemon myoporoides*, and varieties of hebe and philadelphus already described are suitable subjects for growing in a damp spot.

There is a wide colour range in the fuchsia hybrids, and they are nearly all suitable for growing in damp, semishady positions. To be most effective they should be grown either on a bank or as standards, where the flowers can be looked up into. When fuchsias are grown as ordinary bushy shrubs, the beauty of the flowers is lost, as their attractiveness lies in the long coloured stamens and the colour of the "skirt" and inner part of the flower.

The young shoots of fuchsias should be nipped back when they have formed two or three pairs of leaves to form a bushy shrub, and the main pruning is chiefly to cut out old wood and remove unwanted growths.

Dry, Sunny Situations

Acacias thrive in full sun, on a bank that is well drained, or in a position where the soil is normally fairly dry throughout the year. *Acacia baileyana* is one of the earliest to flower, with clear golden blossoms and grey-green leaves which show off the flowers to the best advantage. *A. podalyriaefolia* has silvery foliage and bright yellow flowers, and *A. pravissima* grows to about 15ft., slightly taller than *A. podalyriaefolia* and smaller than *A. baileyana*. From April the tree is a mass of buds which burst into bloom in spring with drooping racemes up to 18in. long. In contrast to other varieties, *A. pravissima* has a willow-like habit of growth.

All ornamental acacias should be pruned immediately after flowering, both to encourage plenty of new growth and therefore flowers and also to maintain a well-shaped tree.

The banksias, natives of Australia, are well known and deserve a place on a hot, dry, sunny bank. The foliage of all the varieties is unusual and the long, cone-like flowers attract both bees and birds. *Banksia ericifolia* has amber cones and *B. grandis* is most attractive with long, pale cream cones.

The cones will remain on the bushes for quite a long time and even when dry are useful for indoor decorations. In the pruning of banksias, and the somewhat similar waratahs and callistemons, the flowers should be cut off back into the leaves directly behind them, never into bare wood. If this is done every year, the bushes will remain neat and more flowers will be produced instead of the energy going into the formation of seed pods, which only detract from the beauty of the shrubs.

Cassia corymbosa is an evergreen from South America which bears terminal clusters of bright yellow, pea-shaped flowers from about January to April. It will grow to 10ft. in its natural state, but may be trained in a spreading form to fill a gap or as a semi-climber. As cassias are surface rooting shrubs, any cultivation round them should be shallow. They need little attention apart from pruning when flowering has finished to maintain the shape and to train in the desired fashion.

Several varieties of grevillea are suitable for a dry position in full sun. The flowers are small, pink and red, and trumpet shaped until they open fully. Then the stamens curl back and the flowers look similar to a snail with the horns extended.

One of the most outstanding is the silky oak, *Grevillea robusta*, but it is not suitable for the average home garden, as it grows into a large tree and takes a good many years to come into flower. It has large clusters of creamy yellow flowers which from a distance look rather like the cones of banksias.

G. puniceus has large bunches of flowers and is more showy than some of the others. *G. rosmarinifolia*, *G. oleoides*, and *G. alpina* are probably among the best known to the home gardener in New Zealand. The chief differences between them are the variations in leaf types and the heights, which range from 3ft. to 8ft. All grevilleas flower in winter or early spring and require pruning regularly each year, as they grow very rapidly.

The pincushion flower (*Hakea laurina*) will stand extremely hard conditions and even seems to thrive under them. The flowers are red with white stamens and when right out form a complete ball. It, too, requires pruning after flowering to ensure a good crop of flowers for the following season.

[Elliott

Grevillea oleoides **has upright foliage and deep crimson flowers.**

Lantanas have already been mentioned for windy situations and further mention may be made of them here. *Lantana sellowiana* is perhaps better suited to dry conditions than some of the others. It has a rambling growth habit and carries a few of its purple flowers for most months of the year.

One of the best shrubs for any type of soil, though not as showy as some, is *Polygala grandis*. It grows to about 6ft. and with careful pruning can be trained into a most attractively shaped bush. The flowers are pea-shaped, purple, and are produced over a long season. It will stand full sun, shade, draught, or even damp and continue to flower, which makes it extremely useful, especially in a small section where growing conditions are far from ideal but some shrubs are desired.

Species for Acid Soils

Many gardeners know that certain shrubs dislike being given lime when planted, but perhaps do not realise that for others it is equally important that the soil should be slightly acid, or lime-free, to start with.

The first of the shrubs requiring acid soil are the evergreen azaleas (*Azalea indica*). The flowers, which appear in early summer, include a wide range of colours (white, pink, red, carmine, and lilac) and there are some with double and semi-double flowers. Azaleas are often grown in conjunction with rhododendrons, as they tolerate a certain amount of shade and being low growing serve to hide the rather bare trunks of some of the rhododendrons.

The ideal situation for *A. indica* is a cool, moist root run with the tops of the shrubs in sunlight. *A. mollis*, the deciduous varieties of azaleas, prefer full sun. The

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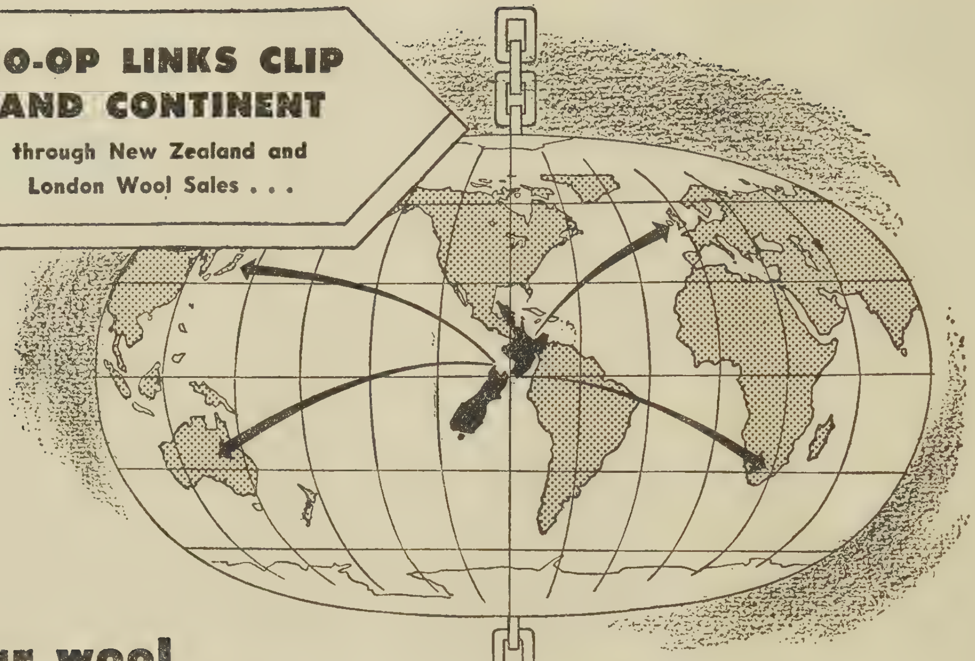

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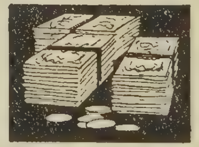

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flowers appear in spring before the leaves and need the sunlight to bring out the full colours of apricot, gold, bronze, and similar shades.

Azaleas do better in the colder districts and are not very successful in the Auckland district. None of them requires much pruning, other than to keep the shrub a well-balanced shape and prevent it from becoming too "leggy".

Boronia megastigma, the popular sweetly scented brown boronia, does not require lime added to the soil, though it will tolerate less-acid soils than other shrubs in this section. It normally likes a sunny position, but where summers are extremely hot or in dry, inland districts, partial shade is beneficial during summer.

B. megastigma lutea is the yellow variety of *B. megastigma*. It is free flowering and scented, though not as strongly as the brown. *B. elatior* has rose-carmine flowers produced for up to 3 months and for that point alone is well worth growing. Though not having the scent of the more insignificant flowered varieties, it is much showier.

B. denticulata has lilac or mauve flowers, which lack the scent of *B. megastigma* but make a better show of colour. The same growing conditions apply to the other varieties as to the brown one, and all the boronias should be shortened back after flowering. They are comparatively short lived and may have to be replaced as frequently as every 5 or 6 years, especially in the warmer climates.

Camellias

Camellia sasanqua and its varieties have already been mentioned and note may be taken here of some of the varieties of *C. japonica*, the taller type, which also start flowering in winter. They will grow in practically any moist, well-drained soil that is lime free.

Spencer's Pink, possibly one of the best known, has single, pale-pink flowers with clear golden stamens. Lady Clare has large, deep pink, semi-double flowers. Great Eastern, an old favourite, is covered with crimson-scarlet blossoms in early spring. *C. grandiflora alba* is a semi-double white with prominent stamens and is probably one of the best of the whites.

There are too many varieties to give a comprehensive list, and choice will depend a good deal on personal preference, but no list would be complete without mention of *C. reticulata*. This is probably the most outstanding member of the camellia family. It has large, semi-double saucer-shaped flowers 6in. across of a clear, rosy salmon. It is not a very vigorous grower, but where there is suitable space and something unusual is wanted *C. reticulata* will prove a good investment.

[*Elliott*

Erica cruenta **carries its scarlet flowers for a long time.**

The daphnes have already been dealt with under shrubs for damp situations, but they also do best in soils which are slightly acid. *Daphne genkwa* is yet another variety of daphne. It is deciduous and the light purple flowers appear before the leaves. These small shrubs do well grown in conjunction with rhododendrons or azaleas.

Some of the best low-growing shrubs for acid soils are the ericas, which vary in height up to 4ft., with some of the dwarf varieties reaching only 18in. Most of this group are winter flowering and there is a wide range, both of colours and forms.

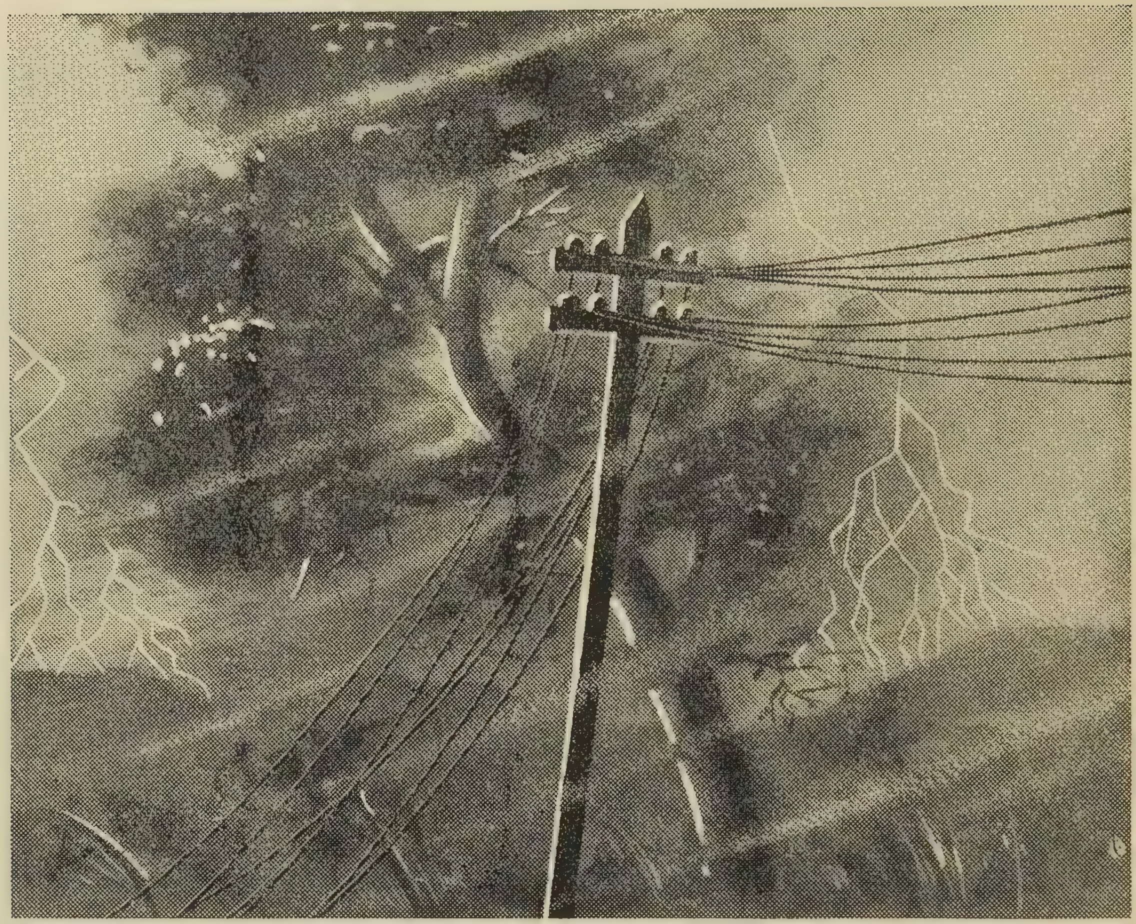
Erica melanthera is the earliest to flower. The small, bell-shaped, mauve flowers are borne in profusion over the bush and make a welcome patch of colour at a time when there is little else flowering. Winter Gem has bright red flowers and comes out soon after *E. melanthera*. *E. darleyensis* (rose pink), *E. parkeri* (with long, shell pink, waxy flowers), and *E. speciosa* (which has long red tubes tipped with green) are a few of the many worth growing.

E. wilmorei, with creamy white tips to the rose pink flowers, is very striking. For flowering over a long time, *E. cruenta*, which has scarlet flowers, can be recommended. The only pruning which ericas require is removal of the spent flower heads and shaping of the bush.

Rhododendrons

To complete this list of shrubs for acid soils there are the rhododendrons, which are excellent either for growing in the shrub border or as specimens. In the last few years many new varieties have been bred and there is now a wide range of colour, height, and flowering times. There are far too many to give any set recommendations as to which are the best. All that can be done in this article is to give the names and colours of some that flower at different times.

Sir Robert Peel, a good crimson, and Christmas Cheer, pale pink, are two that come out early in the season. Among the mid-season varieties Pink Pearl, a clear pink, flowers very freely



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and forms a compact shrub if given proper attention. The loderi rhododendrons are well worth growing, as they have exceptionally large flowers forming spectacular heads. They prefer semi-shade. *Rhododendron loderi*, the original one, is white, *R. loderi* King George is a scented pink, *R. loderi* Pink Diamond is a rich, clear pink and fragrant, and Loder's White has frilled trusses of blush pink fading to white as the flowers open.

All these are mid-season flowering and are quite hardy. Of the late blooming ones, Tally Ho, with large heads of a fiery vermilion, and Red Riding Hood, with scarlet trusses, are both good and are also hardy. Cornish Cross, also among the late-season group, has waxy pink pendulous flowers.

Few of the newer varieties grow very tall, which makes them more acceptable for gardens where space is limited. Sir Robert Peel is the only one in the above list that grows very high, usually about 15ft. under good conditions, and it will tolerate less acid conditions.

Rhododendrons prefer a moist soil which is well drained as well as being acid. The addition of leafmould or compost will produce better results. A mulch with sawdust or similar material applied while the soil is still moist in early summer will help to keep weeds in check and to conserve the moisture in the soil. In very hot districts, semi-shade is preferable, but otherwise rhododendrons do best in full sun. Pruning consists of removing spent flower heads and trimming to shape the shrubs.

Work for April

Autumn brings the beauty of coloured foliage and berries, but also the tasks of cleaning up fallen leaves and plants which are past their usefulness and preparations for future displays.

Cutting over and Replanting Borders

As perennial plants finish flowering the tops can be cut down to within 2in. of the ground. Annuals which are spent should be removed. To keep the border neat and tidy until frosts cut down the later-flowering plants, lightly fork between the plants after cutting off the dead flower heads and stalks. At the same time plant labels should be checked and a note made of any necessary adjustments to the border or plants which should be ordered.

In districts where frost has already cut the tops of the plants, dahlias should be cut back to 6in. from the ground. The end of the stalks will then harden and mature and the danger of frost killing the plants as far back as the tubers will be lessened.

As stakes are removed they should be scrubbed clean under the tap. An upright box in a corner of the tool shed is ideal for storage of these stakes.

At least two types of iris may be planted now to ensure that the roots are established before cold weather sets in. These are the Japanese iris *Iris kaempferi* and the spuria group, including *I. ochroleuca*, both of which flower during late November and December and which, though preferring moist to boggy conditions, will flower in any good soil that does not become very dry after flowering. A position near a garden tap could profitably be used for these.

Plants such as hollyhocks, aquilegias, lupins, carnations, Canterbury bells, and sweet william can be planted out now to fill any gaps where annuals have been removed. Where the soil is well drained and deep the swollen roots of ranunculus can be planted now to give colour in spring. Compost or animal manure plus a mixture of 3 parts each of blood and bone and superphosphate and 1 part of sulphate of potash at 4oz. per square yard will encourage good blooms. The roots should be planted 2in. deep, 12in. apart, and with the swollen "claws" facing down.

In the colder areas the roots of the more tender border plants such as dicentra, canna, *Lobelia cardinalis*, dahlias, and fuchsia can be covered with straw or sawdust to protect them from frosts.

Bulbs and Bedding Plants

The planting of bulbs should be completed as soon as possible, even where it means the removal of summer bedding material. The spring display should not be made to suffer for the sake of a few late flowers. Old plants should be removed and all disease-free material placed in the compost bin. Roots of fibrous begonias can be stored until next season in a frost-free place.

Beds which were well supplied with organic matter for the summer-flowering plants are ideal for the planting of bulbs such as narcissi and tulips and need be given only a dressing of bone meal at 4oz. per square yard before digging. Some very effective planting schemes are: Pink tulips with double white arabis edged with grape hyacinths, white narcissi and forget-me-nots, parrot tulips and aubretia. So that bulbs are symmetrically and easily planted, the soil should not be consolidated after deep digging but merely raked level.

The bulbs can be planted with a trowel. If the soil is very heavy, some coarse sand should be placed in the bottom of each hole. Walking boards placed along the planting row will prevent the soil becoming unevenly compacted. The bed can then be raked again and over-planted with forget-me-nots, aubretia, arabis, or *Bellis perennis*.

Beds which are to be planted with wallflowers, cinerarias, calendula, beauty stocks, or pansies should be treated well, any available well-rotted organic matter being dug into the first spade depth of soil. A dressing of a balanced fertiliser at 3oz. per square yard can then be raked in. The bedding plants should be set out 10in. to 12in. apart in the centre of the bed, and the edging plants can be set as close as 6in. apart.

The planting of a wide range of bulbs in rockery pockets and mixed beds should be concluded. Even half a dozen bulbs of some of the less commonly grown types, such as dog's tooth violets, streptanthera, tritonia, cyrtanthus, brodiaea, babiana, colchicums, and the winter aconite, will add interest and give pleasure over many years.

Liliums

Bulbs of the deservedly popular lily family should now be plentiful. Because of the fleshy roots and the fact that they are never completely dormant, bulbs should be planted as soon as possible. If planting must be delayed, the bulbs should be held in a cool place in moist sphagnum moss or sawdust.

The ground for lilies should be prepared thoroughly by double digging to a depth of 18in. without bringing the subsoil to the surface. The addition of leafmould or compost is desirable, as lilies require a soil high in organic matter. A rich soil is not needed, however, and animal manure should be used sparingly. A dressing of bonedust can be mixed into the soil at planting.

Most of the larger bulbs should be planted 4in. to 7in. deep, but smaller bulbs should be shallower. To prevent damage by fungous diseases and especially on bulbs which may have been damaged during handling, dusting with thiram before planting is desirable.

Lilium tigrinum and some other varieties produce small black bulbils in each leaf axil. These may be planted out in an inconspicuous area in a mixture of leafmould and sand to develop into flowering bulbs.

During the past few years quantities of lily bulbs have been imported and sold comparatively cheaply. However, these may not be a bargain, as their flowering is generally inferior, especially in the first year, when frequently no bloom appears.

Most lilies, especially *L. auratum* and *L. speciosum*, require an acid soil, though *L. candidum*, *L. hansoni*, *L. henryi*, *L. longiflorum*, and *L. regale* will tolerate alkaline conditions

Planting Out . . .

Before starting to set out a box of plants, stand the box almost on end and sharply tap the end on a solid surface. The plants and soil will shift slightly to the lower end of the box. This will loosen the roots from the bottom of the box and make removal of the first plant easier.

Removing the first plant from the box, using a trowel to cut the section of soil containing the roots.

When planting out draw a line alongside the string with a trowel; the string can then be removed. Planting often pushes a string out of line. The walking board will prevent uneven compaction of the soil. For measuring the distance between plants a marked trowel is useful.

Though all lilies, especially *L. henryi*, require a cool rooting area, positions in the open border or in sunny beds are quite suitable for *L. candidum*, *L. formosanum*, *L. regale*, and *L. longiflorum*.

Lifting and Cleaning Gladiolus Corms

By Easter, gladiolus will have finished blooming and steps should be taken to ensure that the bulbs will be in good condition for next year. The plants should be lifted 6 weeks after flowering and placed in a warm position for 2 to 3 weeks to dry off. By this time the old corm can be removed and destroyed and the foliage cut off 1in. above the corm. The outer layer of fibrous leaf base can be removed from the corms, but the inner layers should not be removed until planting.

The corms should then be dusted with a mixture of DDT and thiram or flowers of sulphur. The former will kill any thrips which may be present and either of the last two materials will arrest fungous diseases which cause spotting or completely destroy corms. The corms should be stored in a dry, airy box or hung in an old nylon stocking and placed in a well-ventilated shed or basement.

Sweet Peas

In all but the coldest districts sweet peas can be sown now to produce blooms over a long period in summer. To ensure this prolonged blooming it is necessary that the ground be prepared thoroughly before sowing.

On all but heavy clay soils a trench 2ft. deep and 1½ft. wide should be dug. If the soil is inclined to be heavy a layer of manuka twigs or bracken should be placed in the bottom of the trench to assist drainage. Replace the soil, incorporating well-rotted animal manure or compost, thus making the surface of the bed higher than the surrounding soil. During winter the trench will settle down to a reasonable level, but meantime the additional height will ensure that the seeding area is well drained.

Heavy clay soils should not be trenched, as this may give the effect of a sump, collecting moisture from neighbouring areas. On heavy soils and where animal manure or compost are not available work into the top spit a mixture of 2oz. per square yard of lime and 4oz. per square yard of the mixture recommended for ranunculus. Germination can be improved by chipping the seed to allow the entry of moisture. Seeds should be dusted with thiram and sown 1in. deep and 3in. apart to allow for thinning of the weaker plants.

General

Seed of larkspur, calendula, sweet sultan, love-in-the-mist, evening primrose and scabious can be sown in the warmer areas in sheltered positions where they are to flower. Seedlings sown last month should now be thinned.

Shrubs should be ordered now and these should be planted as they are delivered. The wrenching of larger plants which are to be moved can be completed. As the plants should not be moved for another 8 weeks, it may be necessary to support them with stakes.

Watering of succulents should be reduced now and a check made on plant labels and names. Plants which have been outside for the summer should be brought into shelter immediately to avoid damage by sudden frosts.

Continue disbudding chrysanthemums and shift potted plants into the glasshouse. Liquid foliar feeding could be combined with sprays of lindane emulsion to kill caterpillars. Plants should be well staked and tied.

Potted bulbs should be brought into the house 8 weeks after planting. Potted geraniums and balsams can be cut back to encourage further growth. Young hydrangea plants can be potted into larger pots so that growth is not checked.

Fuchsias, begonias, achimenes, and gloxinias in pots can be gradually given less water. When plants of the last three have died down the tubers can be removed, dusted with flowers of sulphur, and stored in a dry place until planting.

Leaves of deciduous trees should be added to the compost heap. Partially matured heaps should be turned, and matured material can be distributed. Lawn edges round the flower beds can be trimmed and the clippings put on the compost heap.

Ties on budded material should be cut as the buds swell. Hardwood cuttings of material such as hydrangeas can now be taken. Except in cold districts, where they provide some protection, spent hydrangea flowers should be removed.

◆◆

Cream Puffs and Eclairs

By MARY HUNT,
lately Home Science Extension Officer, Department of Agriculture, Christchurch

CREAM puffs and eclair cases are made from a mixture which is called choux paste. Cream puffs are so called because they are usually served with a whipped cream filling, but they are equally delicious with any of a variety of sweet or savoury fillings. Their size depends on whether they are to be eaten as a dessert with the main meal, with afternoon tea, or as party savouries.

IF the cases are to be served as a dessert with a filling such as ice cream or fruit, they should be made large. The mixture should be put in tablespoonfuls on a greased tray. For cream puffs to be served with afternoon tea, a heaped dessertspoon is sufficient. Party savouries should always be made small so that they are convenient to handle; a teaspoon of choux paste mixture will make a case large enough.

The shells can be made a more even shape by using a forcing bag and tube. Chocolate eclairs are usually made oblong and are easier to shape evenly with a forcer than with a spoon.

The Mixture

Choux paste has the same proportions of flour to liquid as Yorkshire pudding, but the different method of preparation makes it a much stiffer batter. A high proportion of liquid is used in both.

Yorkshire pudding is made by gradually mixing cold liquid into the dry ingredients, making a very thin batter. For choux paste the flour is stirred rapidly into boiling water and fat, which gelatinises the starch and produces a stiff or drop batter. Eggs are added to provide protein to emulsify the fat.

Baking

No baking powder is necessary for cream puffs, as steam is the rising agent. They are baked in a hot oven for the first part of the cooking period to convert the water to steam and make them rise. When they have risen and browned, the baking is continued at a considerably lower temperature to set the walls and dry out the interior.

If cream puffs are to be cooked in an electric oven, the shelf should be placed slightly below the middle, but in a gas oven it should be placed in the middle or slightly above the middle.

The time allowed for baking cream puffs will vary a little with size. Small savoury shells will need less baking than large shells. The times given in the recipe are for medium-sized shells.

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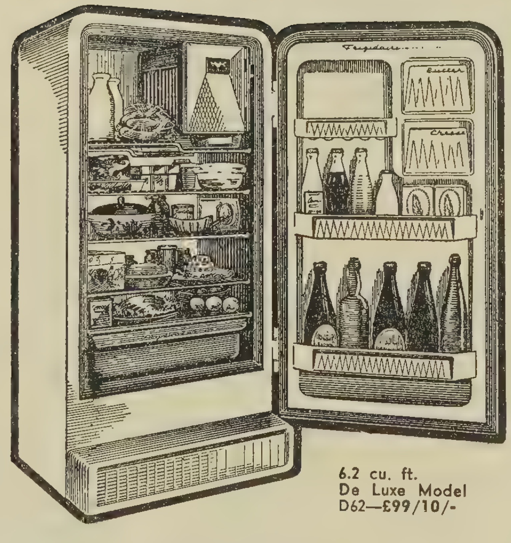

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CREAM PUFFS AND ECLAIRS

Chocolate eclair shells are mixed and baked in exactly the same way as cream puffs, but they are made oblong instead of round.

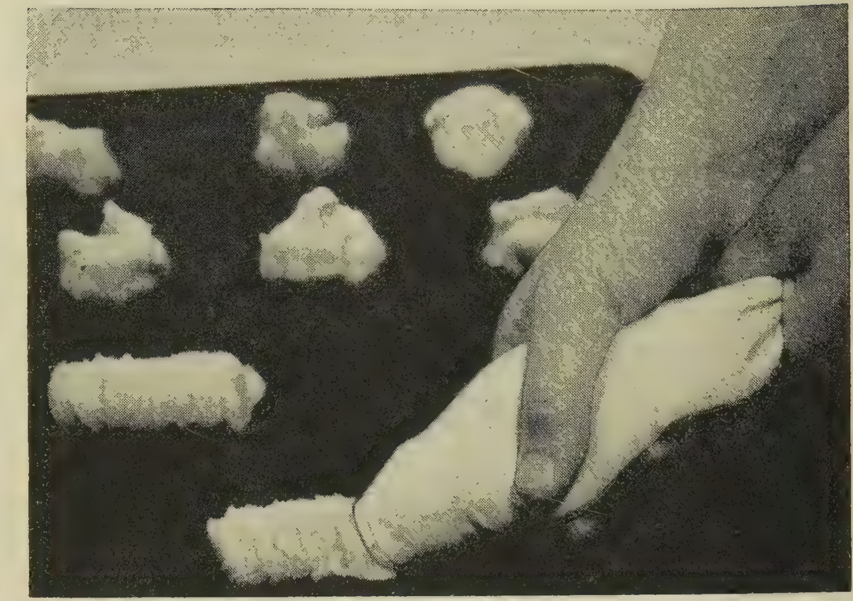
Cream Puff Shells

1 cup of water
4oz. (½ cup) of butter
¼ teaspoon of salt
4oz. (1 cup) of flour
4 eggs

1. Put the water, butter, and salt in a saucepan and heat to boiling.
2. Add all the flour at once and stir vigorously until the mixture leaves the sides of the pan.
3. Remove from the heat and allow the mixture to cool slightly.
4. Add the unbeaten eggs one at a time and beat vigorously after each egg is added. Beat until the mixture is smooth and shiny. It should break off when the spoon is lifted out of the mixture.
5. Drop in spoonfuls (depending on the size required) or force through a forcing tube on to a greased tray.
6. Bake in a hot oven (450 degrees F.) for 15 to 20 minutes; then reduce the heat to 325 degrees F. and bake for a further 15 to 20 minutes.
7. Just before serving cut a slit in one side of each shell and fill with whipped cream or any of the suggested fillings.

Chocolate Eclairs

On a greased oven tray shape the choux paste into oblongs about 3in. long by moving the spoon along as the mixture is pushed off or forcing it through a tube. Fill the shells with sweetened or flavoured whipped cream or mock cream filling (see recipe). Ice them with rich chocolate frosting.



Cream puff cases can be put in spoonfuls on the oven tray, but eclairs are better shaped with a forcing tube.

Sweet Fillings

Mock Cream

½ cup of sugar
⅓ cup of flour
¼ teaspoon of salt
1 teaspoon of vanilla
2 eggs or 4 egg yolks (beaten)
2 cups of milk (scalded)

Mix the sugar, flour, and salt, and stir in the scalded milk. Cook in a double boiler for 15 minutes, stirring constantly until the mixture thickens. Stir in the beaten eggs and cook for 3 minutes. Cool and add the flavouring.

Coffee Cream

Make as for mock cream filling. Scald 2 tablespoons of ground coffee with the milk and strain well.

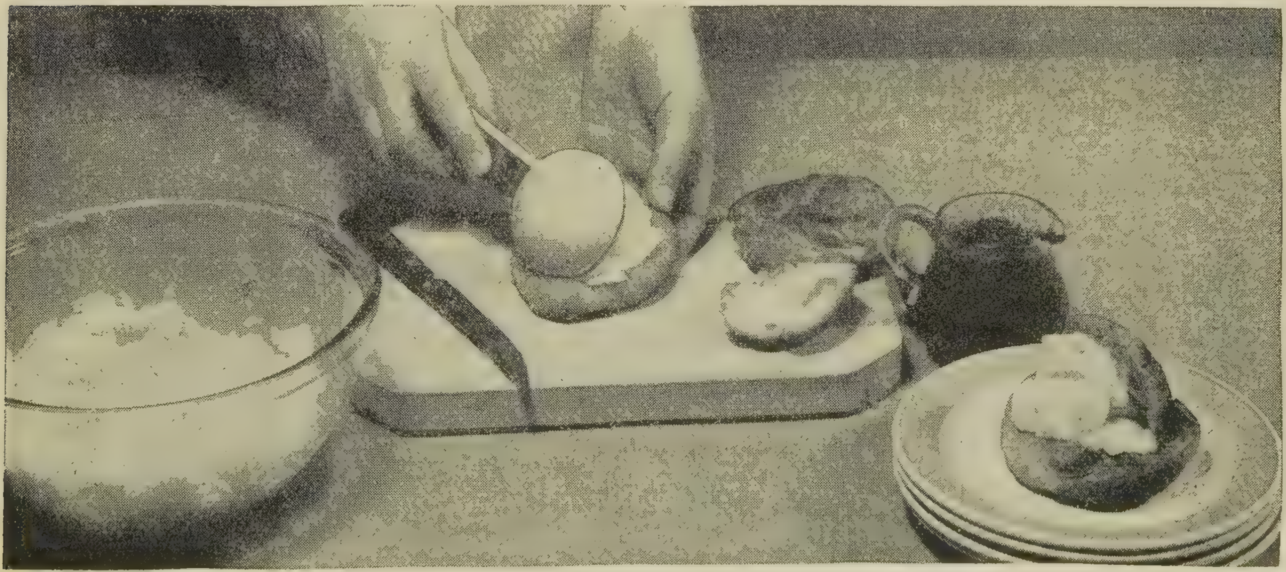
Chocolate Cream

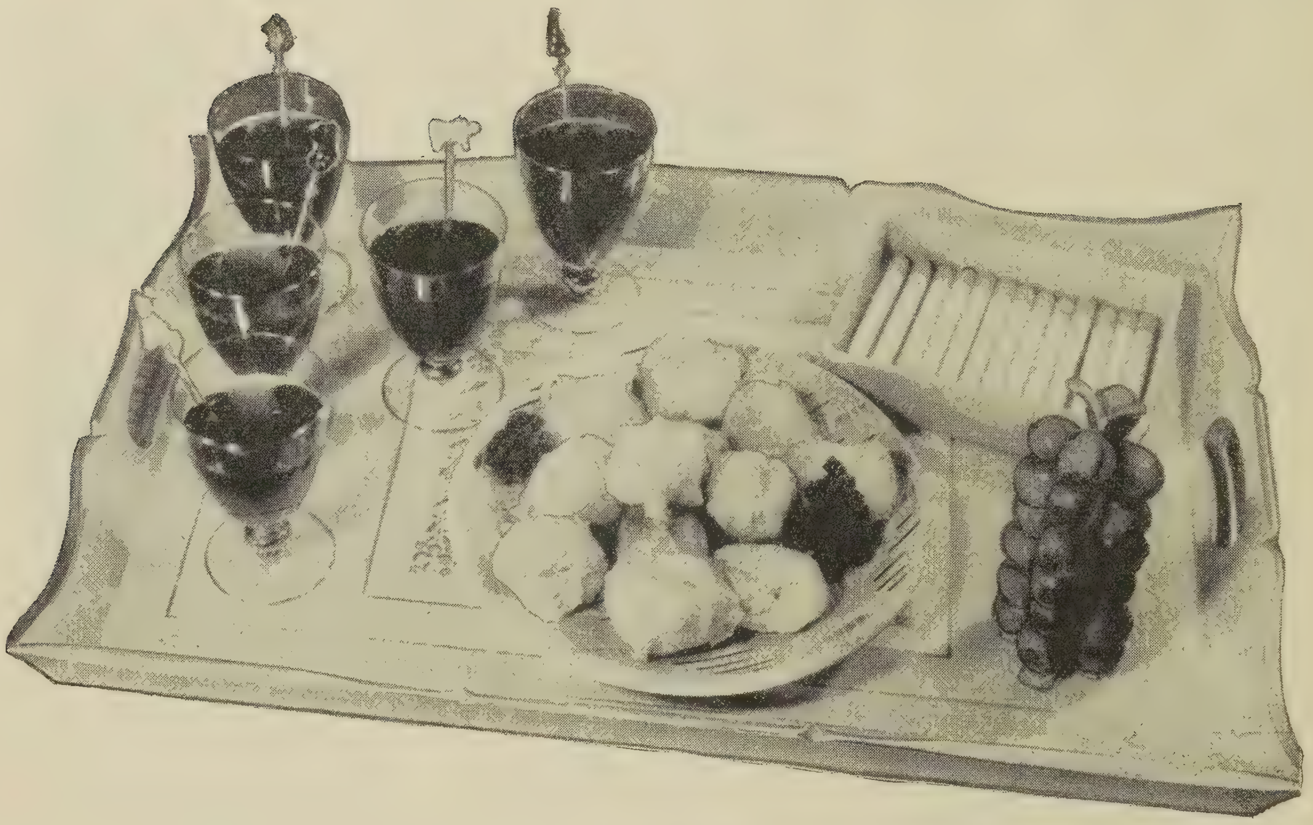
Make as for mock cream filling. Heat the milk and 2oz. of chocolate together in a double boiler. When the chocolate has melted, beat until smooth.

Cream Custard

¼ cup of sugar
Pinch of salt
3 tablespoons of flour
1 cup of milk
1 egg (beaten)
½ teaspoon of vanilla
½ cup of cream (whipped)

▼ Cream puffs can be filled with ice cream and served as a pudding with chocolate sauce.





Small cream puffs with savoury fillings make an excellent accompaniment to cocktails.

Mix together the sugar, salt, and flour and add the milk. Cook in a double boiler, stirring constantly. Bring to the boil and boil for 1 minute. Stir part of the mixture into the beaten egg and then stir this into the remains of the hot mixture and bring to the boil. Cool and add the flavouring. Fold the custard into the whipped cream.

Fruit Fillings

Cream puffs can be filled with sweetened berries or with any other chopped fresh fruit. If tinned fruit is used, no extra sweetening will be needed.

Serve the puffs with whipped cream or fold the whipped cream into the chopped fruit.

Ice Cream Filling

Fill the puffs with vanilla or peppermint ice cream and serve with chocolate sauce.

Chocolate Sauce

1oz. of chocolate or ¼ cup of cocoa
1 cup of milk
½ cup of sugar
1 tablespoon of flour
Pinch of salt
2 tablespoons of butter
½ teaspoon of vanilla

Put the chocolate and milk in the top of a double boiler and heat over boiling water until the chocolate has melted. Beat with a rotary beater until smooth. Mix the flour, sugar, and salt and mix in a little of the hot milk. Add this to the remainder of the milk and continue cooking until thick, stirring constantly. Add the butter and the vanilla. Serve hot.

Savoury Fillings

Savoury fillings are used mainly in small puff cases suitable for party snacks. Meat, fish, and many other foods mixed with some thickened sauce or salad dressing make suitable fillings.

Ham

½ cup of minced ham
½ cup of medium white sauce
1 teaspoon of chopped parsley
1 hard boiled egg (chopped)
¼ cup of grated cheese
Seasoning

Mix all the ingredients and bind with the medium white sauce made from ½ cup of milk, 1 tablespoon of butter, and 1 tablespoon of flour.

Chicken

Mince the chicken and add a little crushed pineapple and enough salad dressing to bind; season to taste.

An alternative is to mix the minced chicken with medium white sauce or chicken gravy or a mixture of the two.

Salmon

Mince the salmon and add a little salad dressing and lemon juice. Season to taste.

Oyster

2 dozen oysters (halved or chopped)
3 tablespoons of butter
3 tablespoons of flour
½ cup of milk
½ cup of oyster liquor
Salt and pepper
Dash of nutmeg

Make a thick white sauce with the butter, flour, milk, and oyster liquor. Season with salt, pepper, and nutmeg and add the oysters.

Mushroom

1 rasher of bacon
½lb. of mushrooms
Bacon fat
¾ cup of milk
2 tablespoons of flour
Salt and pepper

Cut the bacon into small pieces and fry for a few minutes. Peel and cut up the mushrooms and fry them in bacon fat until soft. Add the milk and season to taste. Thicken with flour mixed to a smooth paste with a little milk. Add the bacon and cook for a further 2 or 3 minutes.

Other Fillings

Other suggestions for savoury fillings for cream puff cases are creamed sweet corn, cream cheese (seasoned), creamed whitebait, curried eggs, and creamed asparagus tips.

Care of Leather Goods

By MAUD B. STRAIN,
Home Science Instructor,
Department of Agriculture,
Dunedin

GOOD leather shoes, handbags, and luggage are so much a part of everyday life that often little thought is given to their care and even less to the excellence of the material. Leather is an aristocrat among materials and with a little regular care for most uses it will last a lifetime and maintain its good looks. The most hygienic and durable shoes and the handsomest travelling cases and handbags are made from leather, which is the processed skin of various animals.

Many leather articles are in common use today and their life is prolonged by care and attention.

TO understand leather one must remember that originally it was live skin. Live skin is a most versatile material; it is tough yet flexible and has the unique property of being able to prevent water from coming in while at the same time permitting perspiration to go out. Dead skin loses all these characteristics and rots if it is constantly damp and becomes hard and brittle if it dries out. The process of turning skins and hides into leather keeps the fibres separate and loose and preserves them from decay and retains for the leather some of the characteristics it had when alive.

Basic Needs

The care of leather is basically the same as that required to keep the human complexion in good order. To keep it clean it is best washed in mild soap and warm water. If it becomes dry, it needs creams and oils to keep it soft and pliable. It is improved by occasional rubbing or massage and it can be easily damaged by direct exposure to heat.

Leather should never be dried at a temperature above body temperature and the wetter it is the more susceptible it is to damage. Wet leather is soft and readily stretches out of shape, stitches cut through it readily, and it wears away rapidly. It must be allowed to dry in its own time at ordinary room temperature and preferably where there is good air circulation. Many a good pair of shoes has been ruined by being placed while wet against a hot radiator or steam pipe. Wet or dry, leather is ruined by excessive heat, which makes it hard, dry, and brittle.

In normal use leather tends to lose the oils and greases which have been worked into it during the tanning process, and this will occur more quickly as a result of much wetting. To keep the leather in good condition these must be restored to it. Before any dressings are applied to leather it must be clean. This will mean brushing and dusting to remove any dust and dirt, rinsing with a damp cloth, and wiping dry with a clean, dry cloth.

In a centrally heated dwelling where the air is kept specially dry and warm leather may require a little extra attention. A good leather dressing applied according to directions and used at regular intervals should keep the fabric soft and pliable and combat the ill effects of a dry atmosphere. One authority recommends applying white petroleum jelly to the leather, wiping off the excess with a soft, clean cloth, and then rubbing the surface with a chamois leather or a flannel polishing cloth.

Luggage

Leather baggage, golf bags, attache cases, and similar articles should be kept in good condition by being dusted frequently. They should be washed with saddle soap and polished with shoe polish in a matching colour. Worn corners or scratches should be treated as soon as possible with shoe polish. Baggage should never be stored without first being cleaned.

Furniture

Leather furniture is usually found in the form of large easy chairs and chesterfields, and seats and backs of dining chairs. Regular, careful dusting keeps these in good order, but any soiling requires attention. Slight soiling can be removed with a cloth wrung out of warm soapy water, but if the leather is dirty, it should be washed with saddle soap, dried, and polished.

It is advisable, however, to feed furniture leather occasionally with an oil emulsion, as the leather does dry out gradually, particularly if it is subjected to sunlight or heat. Milk is very suitable because of its fat and casein content, the latter forming a protective film. The milk should be diluted with water, 1 part of milk to 2 parts of water. A good method is to wipe over the surface of the leather with the milk, rub it well in, and when the leather is dry polish it well.

The polishes used supply the lubricants which keep the hide supple and prevent it from cracking. No more should be applied than can be readily absorbed by the leather, and a final thorough rubbing will ensure that nothing is left on the surface to mark clothing.

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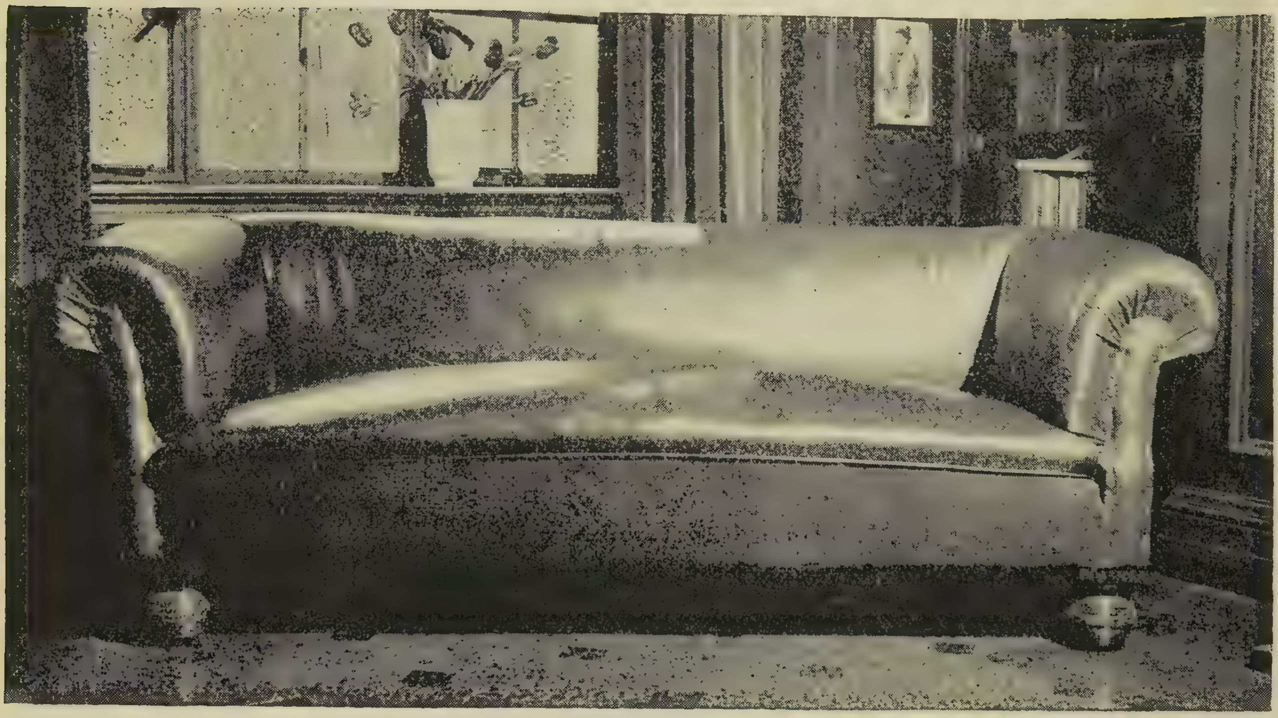


Furniture upholstered in leather is durable, comfortable, and easily cared for and possesses distinction.

Leather furniture should not continually be subjected to strong sunlight or to direct heat from a fire. Scratches can often be made less noticeable by the application of shoe polish or leather stain of the right colour, and then by polishing in the usual way.

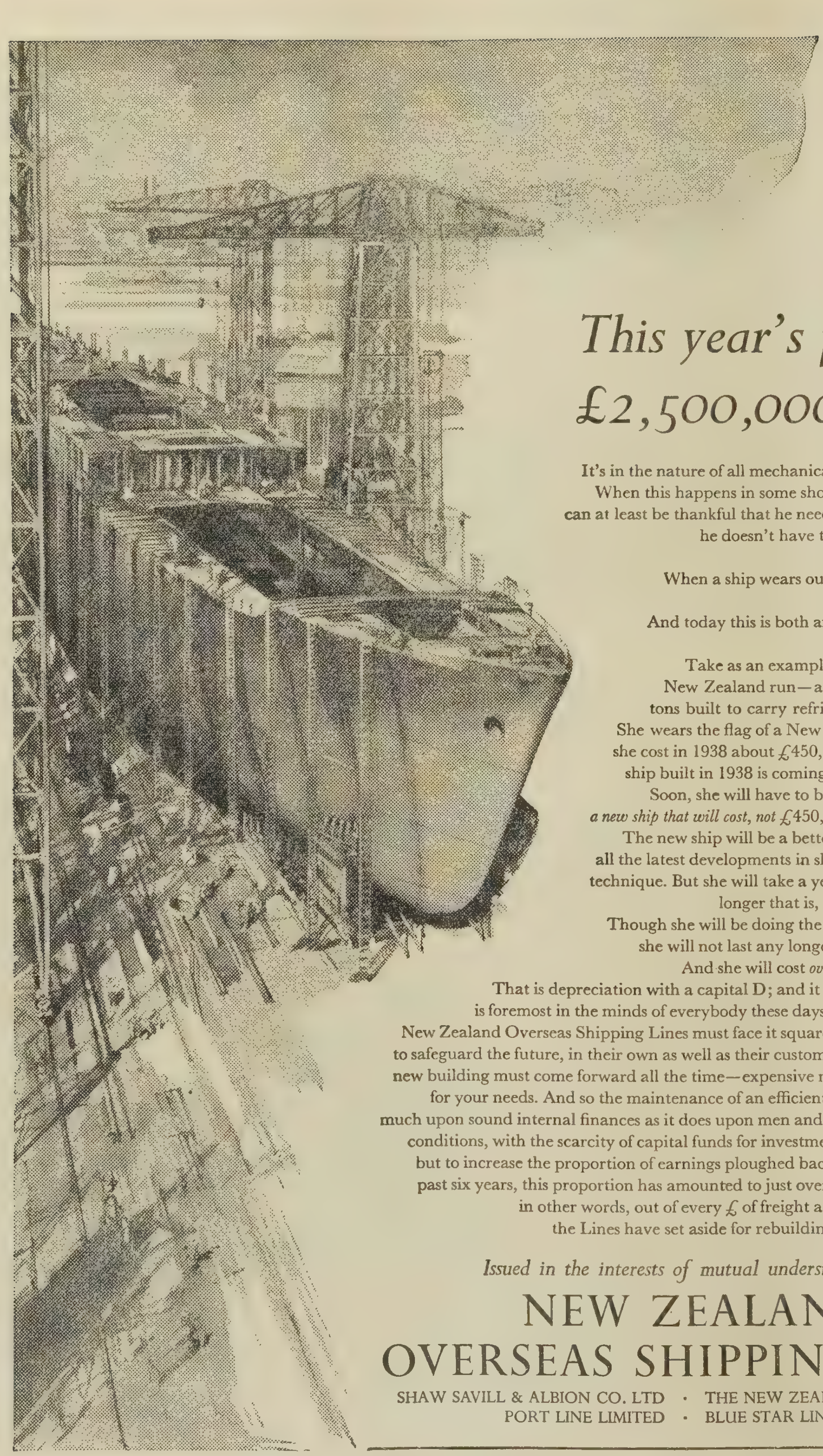
Mould sometimes appears on leather kept in a warm, damp place. This does not seriously harm the leather unless it is allowed to remain too long, but it may change the colour. Mould should be removed and with shoes a fungicide should be applied. If this is not done, moulds can grow in the perspiration and destroy the threads and linings. When first detected the mould should be washed off with soap and warm water or wiped off with a damp cloth and the leather well dried.

Footwear

For leather footwear regular cleaning with a good polish is essential. All mud and dirt should be removed with a stiff brush, or, if the mud has become caked on, the muddy parts should be washed. Shoes should never be left with mud adhering to them, because the oils in the leather pass into the mud. The mud should be washed off and the shoes left to dry at room temperature in a current of air. Special care should be taken to remove dirt from the welts where the sole joins the upper, as grit and sand left there will cut into the uppers.

Shoe polish should be applied thinly with a soft brush or cloth. For light-coloured shoes a cloth is preferable, as it is easier to work the polish into the leather with it and it can be more evenly spread. The pressure that can be applied with a cloth cleans marks from leather better than does a brush. It is more satisfactory if the polish is not allowed to dry on the shoes but is polished off immediately and the shoes are buffed up with a velvet pad or soft duster. The glass-like polish often seen on well-kept shoes is attained only by constant cleaning and polishing, assisted sometimes by a rub over with a damp duster followed by more vigorous polishing.

The grain of the leather can be clearly seen in this close-up of a crest which has been tooled on the leather on the back of a dining chair and outlined in gold. Leather is an ideal medium for tooled designs.



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A white shoe cream is excellent for cleaning shoes and other leather goods and has the advantage of not rubbing off on to the stockings, but it is not entirely satisfactory for coloured shoes. These tend to lighten with use and a cream of the same colour is necessary to restore the original colour. It is a wise precaution to apply to new light-coloured shoes a cream of matching colour before the shoes are worn. This forms a waterproof film which prevents rain spots marking the leather. The soles of new shoes should not be subjected to wet when first used, as this can do serious harm to the leather and even the best of sole leathers may become more soft and wear out quickly if so treated.

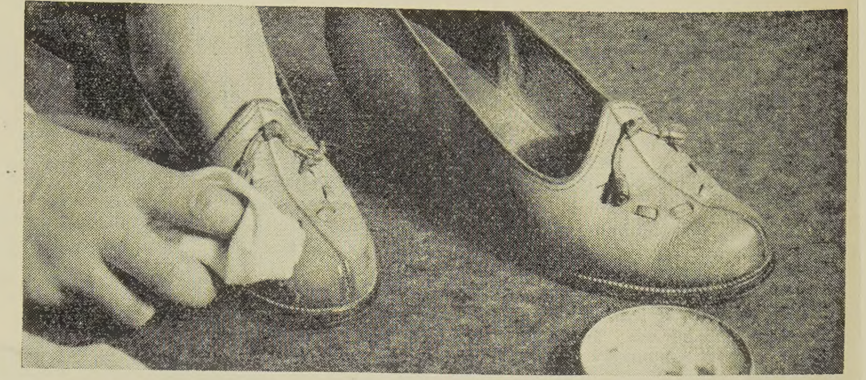
It is economical to have two or three pairs of shoes in regular use so that one pair need not be worn on two successive days. This gives the shoes an opportunity to dry out thoroughly between wearings and helps to keep them in their original shape. The use of shoe trees of the correct size is most helpful in preventing the formation of permanent creases where perspiration tends to gather and cause cracking of the surface, since perspiration de-tans leather.

Heavy outdoor shoes need special care to prevent the leather hardening in wet weather. When the wet shoes are removed from the feet all dirt should be wiped off and neatsfoot oil lightly applied to the wet leather before it is dried. Frequent use of saddle soap followed by treatment with a waterproof dressing will preserve their appearance, keep them in good order, and prolong their life.

Calf shoes coloured with aniline dye require treatment rather different from the usual shoe cleaning. Only the best and most delicate calf skins are used for this leather, which is finished with a clear film that brings up the natural grain of the leather. A clear wax polish should be used. It should be worked into the cleaning cloth and then applied to the leather. Polish should never be put on the shoe and then spread, as this causes stains to develop.

Suede has a soft, velvety finish and requires careful attention to prevent rubbed, shiny patches appearing. Suede should be brushed all over with a special rubber brush. The pile can be raised by using fine sandpaper or a fine-wire brush, but this must be done carefully and not too frequently. Liquid suede cleaner of the appropriate colour is sometimes helpful in restoring the colour to worn patches. The cleaner is applied to the dust-free surface, allowed to dry, and lightly brushed off. Sometimes these cleaners rub off on to stockings or any light-coloured material which they may touch.

Patent leather's characteristic glass-like surface is given by a special enamel finish. Patent leather shoes



Leather shoes need frequent cleaning to remove harmful dust and dirt and to restore to the leather some of the oils and greases which tend to dry out during wear.

Suede shoes are soft and comfortable in wear, but they require care to prevent shiny patches appearing. The rubber brush (right) will remove dust, and the bristle and fine-wire brush (left) will help to raise the pile.

Two methods of helping shoes to retain their shape. Adjustable metal shoe trees are used in one pair, and crumpled newspaper, which is particularly suitable for wet shoes, serves the same purpose for the other pair.

CARE OF LEATHER . . .

should fit really well; if they are too small and the shoes are not warmed before they are worn, the strains set up will cause the not very elastic finish to crack. It is advisable to warm the leather in the hands before the shoes are put on. The shoe should be dressed occasionally with a little shoe cream or castor oil.

The care of white shoes of the type worn by nurses requires special attention. White cleaners consist of pigment and binder. The latter may cement the leather fibres and cause the surface to crack when flexed. White cleaner should be used sparingly on surfaces from which previous applications have been removed. This will prevent the caking of the fibres and so prevent the breakdown of the leather.

Shoes that have to be stored for any length of time should be put on shoe trees and cleaned well before they are stored in an airy, dry cupboard. Under damp conditions mould develops both inside and outside shoes.

Gloves

Leather gloves that are guaranteed washable are now available. They should be washed frequently so that oil from the skin and dirt will not become embedded in the leather, as these harden the leather and cause it to change colour. If gloves have ever been dry-cleaned, they should not be washed.

All leather gloves except those made from chamois and doe skin (which become soft and are liable to split at the seams when wet) are washed on the hands in tepid soapy water with a mild soap or soapflakes. The same motions are used as though the hands were being washed.

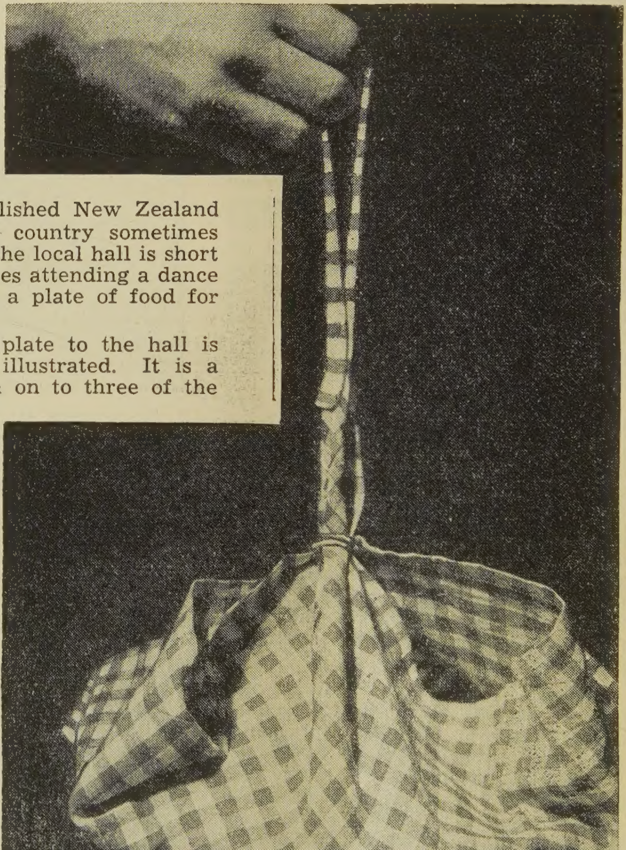
The gloves should not be pulled off by the fingers but should be gently rolled off from the wrists. They are then rolled up in a turkish towel, starting from the finger tips. The rolled towel is kneaded and pressed to remove as much water as possible and then unrolled, and the gloves are blown into to puff them up.

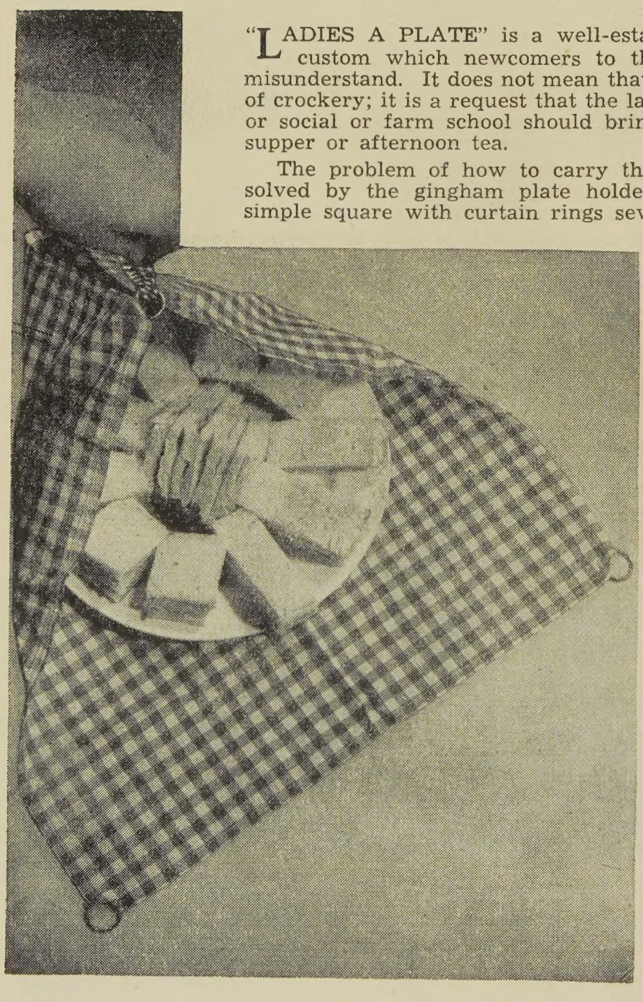
They should be hung in a shady place to dry and not in direct sunlight, near a radiator, or any direct source of heat. If the gloves seem to be too stiff when dry, they should be moistened slightly by rolling them in a damp towel and the leather manipulated gently until the gloves are soft and pliable.

Belts

The high shine obtained on Army belts is obtained by brushing in tan boot polish, damping slightly with methylated spirit, and honing with the handle of an old tooth brush.

An Easily Made Plate Holder





"LADIES A PLATE" is a well-established New Zealand custom which newcomers to the country sometimes misunderstand. It does not mean that the local hall is short of crockery; it is a request that the ladies attending a dance or social or farm school should bring a plate of food for supper or afternoon tea.

The problem of how to carry the plate to the hall is solved by the gingham plate holder illustrated. It is a simple square with curtain rings sewn on to three of the corners. The fourth corner has a loop of material about 3in. long stitched firmly into place.

The loaded plate is placed in the centre of the cloth and the loop is threaded through the three rings, making a package not unlike the French workman's lunch in a knotted handkerchief.

The plate holder is easily and quickly made and would be a useful contribution to a stall at a bazaar or fair.

—BETTY M. JOHNSTON,
Home Science Instructor,
Department of Agriculture, Wellington

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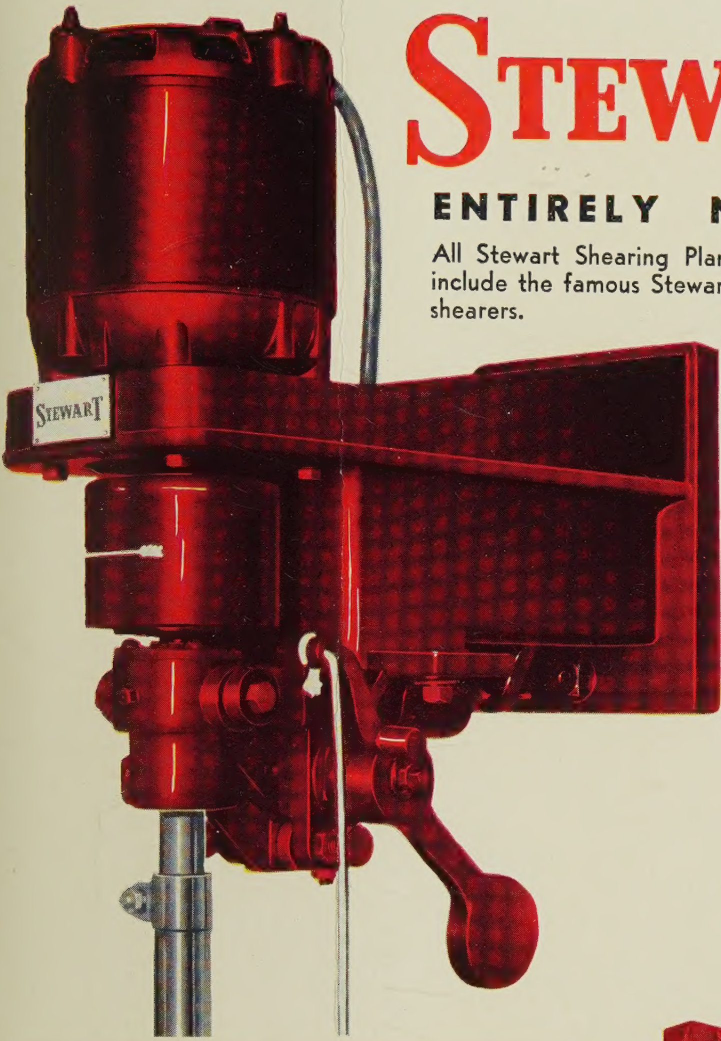
STEWART PROUDLY ANNOUNCE

ENTIRELY NEW ELECTRIC GEAR

All Stewart Shearing Plants are supplied complete in every detail and include the famous Stewart E.B. Handpiece, the choice of nine out of ten shearers.

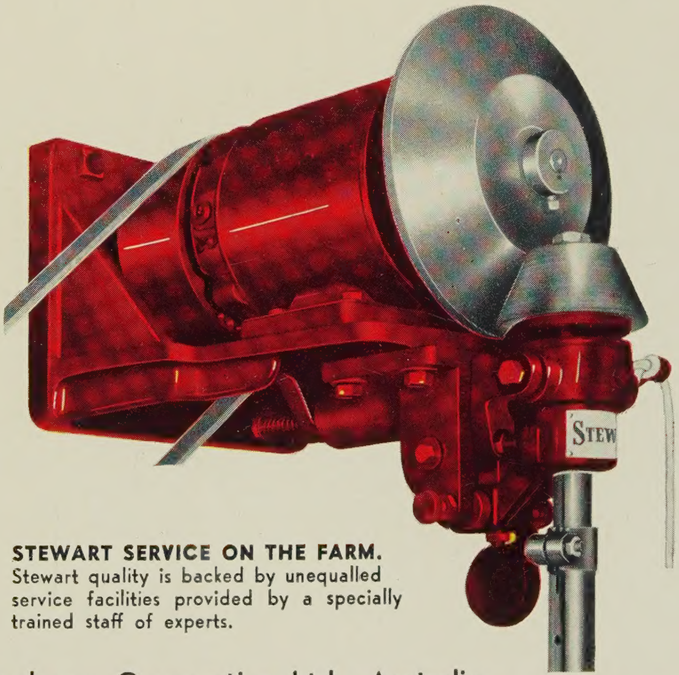


VERTICAL TYPE

This new model is the result of long and careful research, study and improvement wherever possible of the previous type. It has been precision-built—tested—pulled down and again tested. These tests, over a long period (much more severe than normal use), have seen it come out with flying colours. The new vertical gear is the answer to electric shearing efficiency, reliability and long service.

HORIZONTAL TYPE

Stewart have developed this additional model specially for the small woolshed—it's a two-purpose unit that has all the Stewart quality and precision workmanship behind it. Provision has been made for driving a single-ended, belt-driven, ball-bearing grinder direct from the shearing motor without the use of a countershaft and this combination provides the most economical and complete electric shearing plant for the smaller sheep owner.



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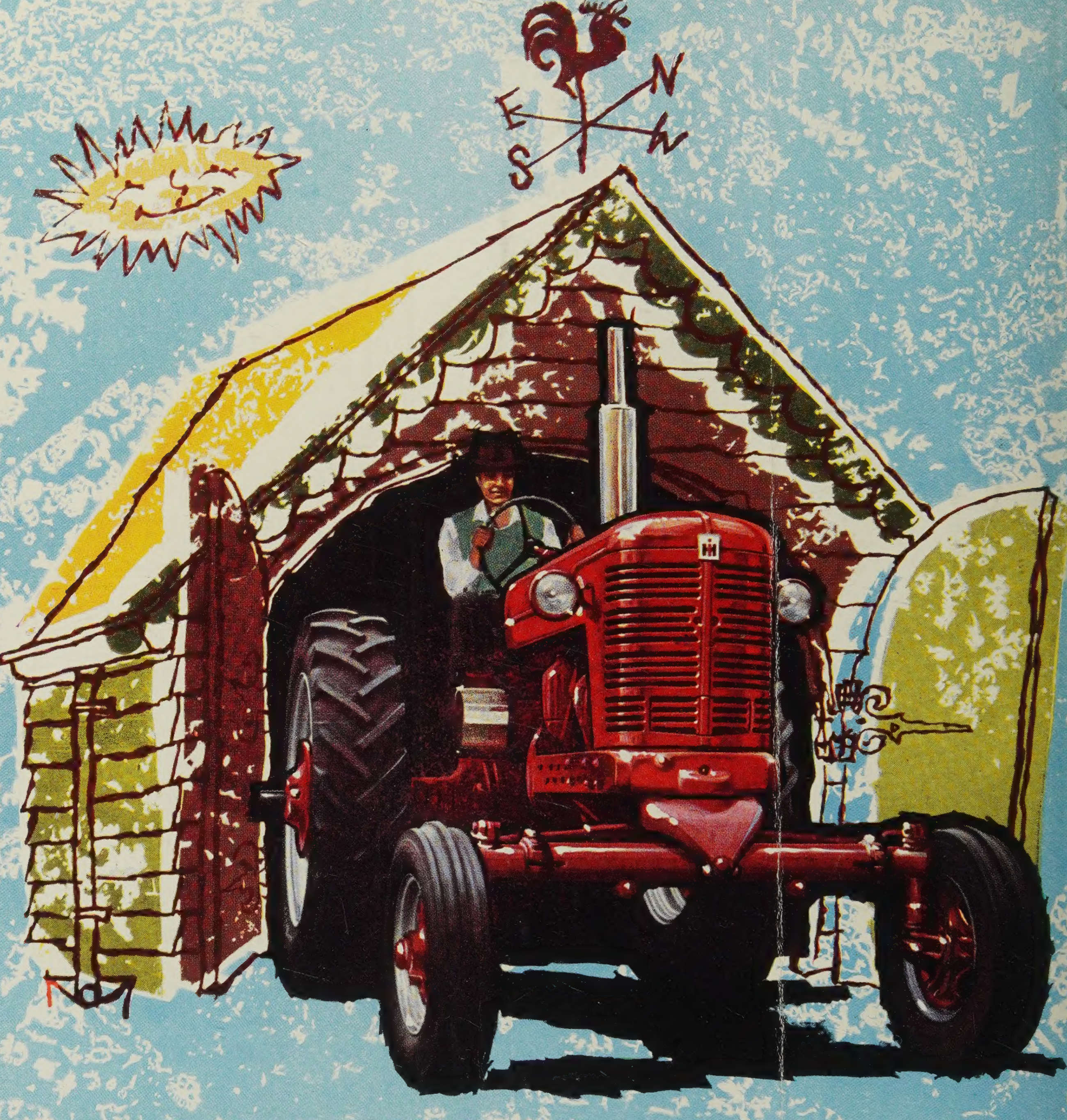

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